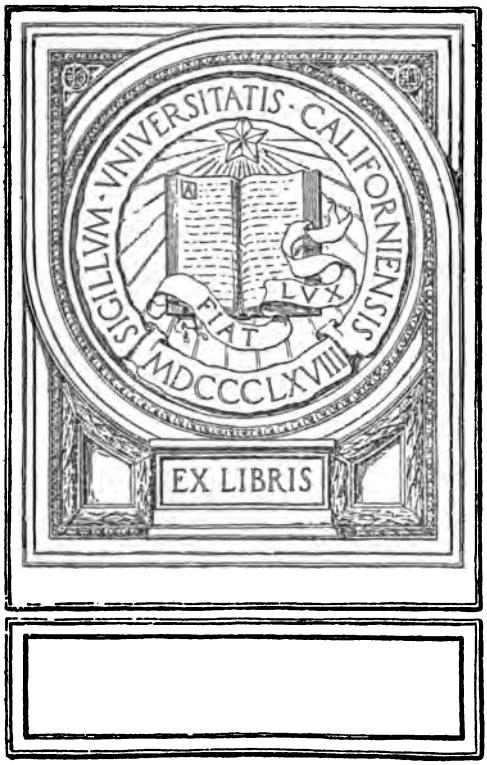

ORGANIZATION CHART

BOARD OF DIRECTORS

FUNCTIONAL COMMITTEES

Finance	Accounts	Statistics	Factory	Labor	Sales	New Development
Pres. Gen. Mgr. Adviser	V. Pres. Treas. Secy.	Secy. V. Pres.	Gen. Mgr. Adviser SalesMgr.	Secy. Gen. Mgr.	SalesMgr. Gen. Mgr. Secy.	SalesMgr. Gen. Mgr. Treas.

ADVISORY STAFF

Counsel
Auditor
Assistant to V. Pres.
(Leak Hunter)
Chief Engineer
Mechanical Expert
Chemist
Advertising Expert

Reporting to department executives or to functional committees.

DEPARTMENTS

	ACCOUNTS AND STATISTICS	FACTORY	SALES
EXECUTIVES	Secretary	Gen. Mgr.	Sales Mgr.
UNDERSTUDIES	Ass't Secretary	Ass't G. Mgr.	Ass't S. Mgr.
OPERATING FORCE	Cashier Clerks	Superintendent Foremen Workmen	Salesmen Clerks Warehousemen

INVESTIGATING AN INDUSTRY

A SCIENTIFIC DIAGNOSIS OF THE DISEASES OF MANAGEMENT

BY

WILLIAM KENT

CONSULTING ENGINEER

AUTHOR OF "THE MECHANICAL ENGINEER'S POCKET BOOK" AND OF "STEAM BOILER ECONOMY"

WITH AN INTRODUCTION BY

HENRY L. GANTT

AUTHOR OF "WORK, WAGES AND PROFITS"

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PREFACE

THIS book is a reprint, with a few slight alterations, of a series of nine articles that appeared in *Industrial Engineering*, February to October, 1913. It relates to the application of the principles of scientific management to all industrial problems, including those of distribution and selling, and incidentally treats of some of the causes of the "high cost of living."

INTRODUCTION

MR. KENT is not attempting to put before the public a new idea; he is simply elaborating an old one. In fact, his whole book is based on the old saying "Look before you leap." In other words, find out all possible facts about an industry before making up your mind about it.

Many intelligent people will tell you that they do investigate thoroughly any enterprise before going into it, yet not a few enterprises fail for reasons that could have been known beforehand.

Everybody agrees that the prospects of a new enterprise should be very carefully investigated before it is gone into, but the failures from causes that could have been foreseen are sufficiently numerous to make it clear that as yet such investigations have not always included all the factors involved. The great value of Mr. Kent's book is that he puts the subject in concrete form, and shows clearly what may be accomplished by proper work in this field. It is not to be expected that many readers will agree in detail with all of Mr. Kent's suggestions, but they will set people to thinking. The fact that he so strongly insists on the application of the scientific method as

far as possible to all business problems is of great importance, for in the past too many questions have been decided by "judgment," which is often another word for guess.

Before, however, the use of the scientific method can become universal, our leading men must appreciate its value, which they do not to-day to any great extent.

He also makes clear that it is not only the new enterprise that needs to be investigated, but that in every established business we should continually know not only how well each one of its functions is being performed, but exactly how it stands with reference to its competitors in the most important factors affecting its welfare. A knowledge of the advantages or disadvantages it possesses with regard to its competitors should always be available if possible. If this is not possible they should be studied carefully at frequent intervals. Among the heads under which these comparisons should be made are location, equipment, system of management, policy, and selling methods. A careful comparison as far as possible of each one of these subjects will often shed light on the questions to what should be done to make a company more prosperous.

Such investigations and comparisons only too frequently show up defects that all will admit, but which it takes heroic measures to correct.

If on account of changes of any kind the location ceases to be desirable, it is extremely difficult to get up sufficient courage to transfer the business bodily to a new place better situated. Deficiencies in equipment are the most easy to remedy, and a change in the system of management to keep abreast of the times does not to-day seem such a radical move as it did a few years ago; but to get a board of directors to change its policy, or a selling organization to reform wasteful methods, is to-day almost impossible of accomplishment. A few years ago the same thing might have been said about the system of management, so it is reasonable to expect that directors and salesmen will as a class some day be guided by facts rather than by "judgment."

With regard to the general subject of "Investigating an Industry," whether it be one that is proposed or one already in existence, the facts regarding the effect of its location can be quite readily determined; questions concerning equipment are being settled, and the subject of management is being quite generally studied. The first two of these subjects are distinctly tangible, and after a comparatively small amount of study the third begins to assume a tangible shape, hence it is only reasonable that these subjects should be first given attention. The effect of the policy as dictated by a board of directors is the most difficult to measure. On this account and

because the directors often know but little about the business it is extremely difficult to get their consent to desirable changes as long as they are making money.

When, however, the balance-sheet begins to show a loss, they are usually ready for changes that are little short of revolutionary. By a proper set of records, or by an investigation from time to time, information might be readily available which would enable the factory to make its changes by evolution. When losses come there is seldom any attempt to find out what they are caused by, but it is generally assumed that they are the fault of the shop. As a matter of fact, it is quite frequent that they are the result of a ruling of the board of directors, who have not understood the effect of the order they gave.

The cost of selling is in most kinds of business extremely large, but that is rapidly coming under the class of subjects to be studied, and the methods of scientific management applied to selling promise to do much to reduce this cost, but, as intimated before, salesmen as a rule are not in sympathy with these methods.

Mr. Kent tells us to study these problems scientifically, illustrates the subject with numerous examples of how such study may be conducted, and tells us what we may expect to accomplish if the results of the study are carried out.

So far what has been written on scientific management covers only the shop, but Mr. Kent feels that the term really includes everything concerning a factory or an industry.

This broad conception of the meaning of the term is undoubtedly correct, and the task of the future is to get the scientific method applied to all industrial problems of whatever kind.

HENRY L. GANTT.

INVESTIGATING AN INDUSTRY

CHAPTER I

General Considerations

THE literature on Scientific Management which has appeared in the last five years has laid so much emphasis on matters relating to the efficiency of labor, that many of its readers, and its writers as well, seem to have lost sight of the fact that scientific management relates to every element in industry, and that labor saving is only one of many elements. Even the authors of the report on "The Present Status of the Art of Industrial Management," presented at the annual meeting (1912) of the American Society of Mechanical Engineers, have failed to recognize this fact, for they say "the term 'scientific management' has been generally and loosely applied to the new system and methods. . . . The expression 'labor-saving management' better conveys the meaning of the movement." Throughout the report "the terms 'industrial management' and 'labor-saving management' are used, the first to denote the subject broadly, the second the newer attitude."

The true relation between industrial management

and labor-saving management may be shown by a chart, as follows:

CHART SHOWING TRUE RELATION BETWEEN INDUSTRIAL MANAGEMENT AND LABOR-SAVING MANAGEMENT

	Kind	
Industrial Management	Traditional or Unsystematized	Characterized by Rule of thumb; no cost systems, no statistics.
	Transitory or Systematized	Cost systems, partial records, occasional investigations.
	Scientific	Investigations of every detail. Studies of product, of process, of machinery, of material, of labor, of burden, of market conditions, etc.

Industrial management means broadly the managing of an industry; it may be good, bad or indifferent; scientific management is both a science and an art; it is the kind of industrial management that makes studies and researches to discover laws and principles in every branch of the business, and that carries on the business in the light that these researches have revealed. Labor saving is one of the objects of scientific management, but not the only one, and labor-saving management is not necessarily scientific management; it may be unscientific. For example, coal-handling machinery and automatic stokers save labor in the boiler room, but under scientific management they would not be installed until it is shown by a careful study of all the conditions that their cost

for repairs, interest on investment, etc., will not exceed the saving in wages. A molding machine will save labor in the foundry, provided there is enough work for it to do, but it is poor management to purchase one unless the market for its product is assured.

One writer, contributing to the report of the committee above mentioned, defines scientific management as follows:

The critical observation, accurate description, analysis and classification of all industrial and business phenomena ~~of a recurring nature,~~ including all forms of co-operative human effort, and the systematic application of the resulting records to secure the most economical and efficient production and regulation of future phenomena.

The committee quotes the following from Mr. Henry R. Towne's paper on "The Engineer as an Economist," written as long ago as 1886:

Executives must have a practical knowledge of how to observe, record, analyze and compare essential facts in relation to . . . all . . . that enters into or affects the economy of production and the cost of the product.

The report says further:

We conceive the prominent element in present-day industrial management to be: the mental attitude that consciously applies the transference of skill to all the activities of industry. Here emphasis is placed on the word *all*, for the restricted application of this

principle to machines and tools has been highly developed for a long period. But its conscious application in a broad way to the production departments, and particularly to the workmen, we believe has been made during the last quarter of a century.

The three quotations express fairly the general understanding of the ablest writers as to what scientific management is, but a critical examination shows that each of them has limitations which it would be well to remove in order to give the term scientific management the broad significance to which it is really entitled. Thus the first quotation may be improved by omitting the words "of a recurring nature," and thereby broadening the meaning. The second and third quotations seem to limit scientific management to the four walls of a shop. They should be expanded so as to cover all the business phenomena that relate to the industry, whether they are inside or outside of a shop. The end of the second quotation might be changed so as to read "all that enters into or affects the economy of production, the cost of the product, the present and prospective market for the product, the selling department and the possible profits." The second clause of the third quotation might read "the mental attitude that consciously applies the principles of scientific investigation to all the phenomena of business and the

transference of skill to all the activities of industry, particularly to the workmen."

Scientific management in its broadest aspect is not merely "labor-saving management," it is not even "shop management"; it is industrial management by the scientific method. It is not limited to cost of production, but extends to methods of distributing and marketing the product, to meeting the changes in character or fashion of the product, to questions of concentration or expansion, of relocation, of finance, etc. Its most prominent element, as stated in one of the above quotations, is a mental attitude, and its result, which will come gradually within the next twenty years, is nothing less than an industrial revolution, comparable with that which occurred when the factory system took the place of the domestic workshop and when the locomotive supplanted the stage-coach.

It is fortunate, in many respects, that industrial revolutions take place slowly. Twenty years after Stephenson's success with the "Rocket," in 1829, the locomotive had made but little progress in replacing the stage-coach. It was more than twenty years after the introduction of the Bessemer steel process before iron rails ceased to be made. In 1870 there were over 700 iron blast furnaces in the United States, with an average capacity of about 5,000 tons per year each; to-day there are about 400, with an average

capacity approaching 100,000 tons each. The 700 old furnaces and most of the companies that owned them are all gone, but they disappeared slowly and with fewer bankruptcies than there would have been if the building of the large furnaces had proceeded more rapidly. The too rapid building of railroads between 1866 and 1873 caused many receiverships and reorganizations, and was one of the causes—if not the principal cause—of the panic of 1873 and the five years' business depression that followed. The law of progress is the law of the survival of the fittest; but the unfit survive a long time. Mental inertia and conservatism are sometimes good qualities in business men. When electric current began to take the place of the mule for street-car service, the companies that held to the mule for some years generally fared better than those that adopted electricity, for the latter found inside of five years that their machinery was obsolete and had to be replaced. Those that waited got the experience of the more progressive without paying for it.

So it will be with scientific management. The success already obtained with it by a few concerns, showing results as stated by the A. S. M. E. committee, "a reduced cost of product; greater promptness in delivery with the ability to set and to meet dates of shipment; a greater output per worker per day with increased wages; and an improvement in

the contentment of the workers" makes certain its continued and more rapid progress, and, say, in twenty years, its general introduction.

The committee's report enlarges on the necessity of slow progress. It says:

The introduction of modern management in a plant must be made slowly. The causes of most so-called failures are principally two: a failure of the executives to acquire the vital mental attitude, and too great haste in application. The latter seems to be the dominant one. Your committee feels compelled to emphasize the danger of attempting to hurry any change in methods of management. Each step of the work should be made more permanent before the next is begun. . . . One of the unfortunate features of this great movement has been the rise of alleged experts who have been ready to promise extravagant results if they are allowed to systematize an industrial plant. The test which they cannot meet is one of permanence.

Some of the causes that will retard the rapid progress of scientific management are: the mental inertia and conservatism of managers and owners; the fact that many of them are uneducated and have never read the literature of the subject; and the fact that as yet there are very few experts competent to introduce the new system. One of the correspondents of the committee writes: "The trouble is that there are not enough managers with

sufficient initiative to set the system moving properly."

Probably few of the readers of *Industrial Engineering* are uninformed as to the general principles of scientific management as related to the shop, and most of them, we trust, have some of the principal books on the subject, such as Taylor on Shop Management, Gantt on Work, Wages and Profits, and Gilbreth on Motion Study. We recommend them also to read "The New Industrial Day," by Wm. C. Redfield, a book which gives no new information on shop or business practice, but which shows in a most entertaining and inspiring way the necessity of scientific management in the business of the future and of the tremendous effect it is bound to have upon the prosperity of the nation and the welfare of humanity. From a chapter on "The Days of the Rule of Thumb" we make a few quotations showing how a successful manufacturer and business man views our present industrial condition:

> The industries of the nation have not sprung within a man's lifetime from childhood to heroic size without showing signs of that disregard for details which makes waste, and that strong striving after results which often pushes to one side as a minor detail the relative cost at which these results are had. So side by side with the great achievements of our manufacturers we should normally look to find that the profits arising from these achievements had been won

at a higher price of waste of all kinds than it will be longer possible to pay, and that the day has dawned when a sober second thought must be taken and our methods readjusted. For our industrial past has truly passed not to return. . . .

The day of the "rule of thumb" in our factories is not yet ended, though its sun is setting. Many superintendents manage to-day as they managed of yore—true offspring of the industrial conditions under which they grew up. There is fearful waste of energy, of human strength and thought, and even of life, and waste also of time and of material and of attention given to relatively trivial things while more serious matters pass unnoticed. We have depended much heretofore upon mere drive, or as we call it "hustling" —crowding into the compressed hours of busy days more and more, and winning out by intensity of effort and by dint of strenuous application rather than by the scientific efficiency which saves all waste and applies the principle of least effort to produce the greater result.

Any radical change in factory management must be a gradual evolution out of that which has preceded it. The present systems or lack of systems, with their good or bad points, are themselves the result of long evolution. No drastic or radical change in them can be suddenly or even rapidly made without causing disturbance. Men have become accustomed alike to the strong and the weak elements in the systems under which they work, and they cling naturally to that which they have been accustomed to do. A factory manager is a busy man. From dawn to dark problems large and small press upon his thought. Questions

of policy, of principle, of practice, of purchase in every form crowd his hours. Amid these cares, often while doing his best, he is conscious that there are better ways, but having only one man's strength he cannot take them up, especially if he has owners above him who are content with anything so long as it pays.

One more quotation: this is from a botanist, Prof. Charles E. Bessey, in an address on The Next Steps in Botanical Science (*Science*, Jan. 3, 1913). He is speaking of plants in the vegetable kingdom, but the words might have been used by an engineer in reference to industrial "plants."

It seems to one who carefully looks over the field that there is often only the most vague notion of the relative importance of the known facts in regard to plants, those of trivial importance receiving as much weight, perhaps, as those of profound significance. . . . We have all heard the excusatory remark that "it makes little difference how or where we begin the study of plants, and in what sequence we pursue it." Yet none of us would admit such a contention in regard to any other matter. The more we know of a country, the more definite are our ideas as to what are its most important mountains, rivers, cities and institutions, and it is these that we feel that the traveller should see. We particularize when we know; we generalize and are vague when we do not.

"The factory manager is a busy man"; "he has owners above him who are content with anything

so long as it pays." Therefore he has "only the most vague notion of the relative importance of the known facts." He particularizes when he knows, he generalizes and is vague when he does not. He may have introduced scientific management into the labor department of his shop, and it pays; he and the owners are content; he knows the labor question, he particularizes on it; but he does not know the power plant costs nor its wastes, the designing department, the purchasing department, the selling department, nor the prospects of the market, and has only the most vague notion of their relative importance.

In the beginning of this article we said that scientific management relates to every element in industry and that labor-saving management is only one of many elements. It is the purpose of this article and those that follow to consider those elements of industry which are not directly related to labor saving.

The foundation of scientific management is scientific investigation, and by scientific investigation of an industry we mean "the critical observation, accurate description, analysis and classification of all industrial and business phenomena" relating to the industry, systematic recording and plotting of data, drawing conclusions from them, predicting future progress under existing conditions and under proposed changed conditions.

The importance of investigating other problems

than those of labor saving and of wages may be shown by the following hypothetical case, which is based upon facts within the writer's experience. A certain business showed the following statistics of two years' business:

A.—Investment in land, building and equipment..... $100,000
B.—Working capital, cash, work in progress, stock in trade, etc., less liabilities..... $100,000

	First Year	Second Year
Interest, repairs, depreciation, taxes, etc., on A	$15,000	$16,000
Interest on B, and on loans in second year	5,000	8,000
Material	100,000	190,000
Labor	100,000	190,000
Superintendence	20,000	25,000
Fuel, light, water, etc	10,000	12,000
Designing, drafting, etc	10,000	15,000
Total factory cost	$260,000	$456,000
Billed to sales dept. at fixed per cent. of list price	250,000	500,000
Apparent loss in factory	10,000	
Apparent gain in factory		44,000
Sales	350,000	700,000
Cost of selling, advertising, storage, etc.	105,000	175,000
Net proceeds of sales	$245,000	$525,000
Billed from factory at	250,000	500,000
Factory loss or gain	Loss $5,000	Gain $25,000
	" 10,000	" 44,000
Total loss or gain	Loss $15,000	Gain $69,000

No account is given therein of value of unfinished work or of unsold goods at the beginning and end of each year, as these are supposed to balance.

The chief fact in the above statistics is that the

product in the second year was twice as great as that in the first year. The labor and material costs per unit of product were practically the same in both years, since most of the men were on piece work or task and bonus. On account of the larger production some economy was effected in the purchase of material, making its cost $190,000 instead of $200,000, and the increased production enabled some saving of labor cost to be made by having fewer tool makers, etc., in proportion to the product. The doubling of the product involved the borrowing of some money, a slight increase in repairs and in fuel and light, and some increase in foremen and draftsmen. The factory was well managed both years. The sole cause that it made $44,000 gain the second year as compared with $10,000 loss the first year is that the sales department called for twice as many goods. Whether this was due to the condition of the market, to greater efficiency of the sales department, or to the fact that in the second year the sales increased on account of the increased reputation of the goods, or on account of the advertising and other efforts made by the sales department in the first year, the results not appearing until the second year, has nothing to do with the management of the factory. Increasing the production could not improve matters, because the production was all that could be sold.

The stockholders receiving these statistics would

naturally be well pleased with the second year's report, and they would scout the idea of an investigation by a management expert. But suppose one of them, farther-sighted than the others, discovers that the business is in a very dangerous condition, that a competitor is about to enter the field the following year, and that there is likely to be a large cut in prices and not enough business for all. What is to be done in view of this prospect? The occasion calls for a scientific investigation of a much broader scope than one that relates only to labor-saving management. What should be done under the circumstances may well be the subject of another chapter, in which the hypothetical case is treated in narrative form as if it were an actual one.

CHAPTER II

A Business Diagnostician

AFTER further explanation of the impending competition and the threatened lowering of prices, it was conceded by all the directors that the business would probably show a loss the following year unless something radical were done to prevent it, but there was no agreement as to the remedy. Among the suggestions made were: Driving the rival out of business by cut-throat competition; consolidating with him or buying him out (something was said here about the Sherman law); extending the market by more extensive advertising and by the employment of more agents and salesmen; trying to build up a foreign market; cheapening the cost of manufacture; cutting down overhead expenses; facing the probable loss in the coming year, hoping that it would be made up the year after by the normal increase in the demand; finding some other thing to manufacture which would be more profitable. A critical analysis of each suggestion showed that each was open to objection; that not one was anything more than a suggestion. Finally, one director proposed that the discussion be suspended and that a

committee be appointed to study all the suggestions and report on them at the next meeting.

Another director made a different proposition. He said, "There is a man in this town who has become a specialist in getting manufacturing concerns out of difficulties. He is a stockholder in several concerns that he has helped to make profitable. Suppose we ask him to meet us and advise us what to do. His fees, I believe, are large, but it may pay us to employ him."

The suggestion was debated awhile and then it was agreed to ask him if he would visit them and have a preliminary talk over the matter. He was soon found by means of the telephone, and an automobile brought him to the office in a few minutes. After introductions the situation was explained to him, and he was asked if he was in position to study the matter and find a proper remedy. The gist of his reply was about as follows:

"My profession is that of doctor of medicine, but I retired from active practice, in which I was engaged for 30 years, about five years ago, and my son is my successor. I had inherited a considerable interest in the manufacturing concern of Blank & Co., Incorporated, and in that way obtained some knowledge of factory troubles. Five years ago, when the concern was in financial straits, I was a director and I had thrust on me the job of getting it again on a

prosperous basis. When I was a doctor I had the habit, when there was a difficult case on hand, never to make a hasty diagnosis, but to keep the patient quiet for a few days to give me a chance to study all his symptoms. I made out a list of all the possible things that might be the matter with him, and then struck out one at a time each item which was negatived by the absence of the symptoms pertaining to it. In this way the list was narrowed to three or four items. I then made a second examination of the patient, using all of the most modern methods and instruments, including chemical analysis and the microscope. If by this time the diagnosis and prognosis were incomplete, I called in one or two specialists in consultation, and in this way a conclusion was reached as to the remedies to be applied. When I tackled the job of Blank & Co., I did the same thing. I made a list of all the possible diseases with which the concern might be afflicted, struck out from the list one disease after another as non-existent, had statistical records and graphic charts made of everything that might have a bearing on the company's troubles, and called in a couple of experts on certain specialties with which I was unfamiliar. The result you know. Without obtaining any additional capital, the concern has paid good dividends for the last three years.

"In answer to your question how I obtained the

knowledge requisite to enable me to make a list of industrial diseases, I may refer to another habit of mine. During thirty years' travel on our suburban railroads I have observed the new factories that were built, and noticed that while some of them grew from small beginnings to great concerns, others, and the majority of them, either did not grow at all, or else changed hands, or remained idle for a year or two before finding new tenants. Many of my patients were owners and managers of these factories, and some of them I had to treat for nervous prostration caused by worry about their business. It seemed to me that industrial concerns had about as many different diseases and causes of disease as human beings, and curiosity led me to inquire into these causes. Some of these causes might be called pure luck, or accident, which no human foresight could have prevented, but even in these cases there was no insurance provision against bad luck or accident. We put up fire escapes on our buildings, we guard our machinery, and we insure our factories and our lives, but we take no insurance against a financial crisis, against strikes, or against ruinous competition. Besides luck and accident, I have found certain microbes that affect industrial concerns. Some of these are: (1) Conceit, the owner thinking that he knows his own business and that no one else knows it as well as he does. (2) Ambition, or too great

progressiveness, trying to be the leader in new things. (3) Inertia, or too little progressiveness, waiting till your rivals succeed with a new thing before investigating whether you ought not to have it. (4) Recklessness, making changes in the business without counting the cost. (5) Fickleness, the lack of 'stick-to-ativeness.' The successful man "like a postage stamp, sticks to a thing till he gets there." (6) Stupidity, too great 'stick-to-ativeness.' Sticking to a thing after it has proved a failure. (7) Nepotism, putting one's relations into prominent positions just because they are relations.

"Now these seven microbes, and there may be others, are not possessions of the business itself, but of its owners or directors. Their investigation is a study in psychology. Next in order is a psychological investigation of the general manager, and of the superintendents of the sales department and of the production department, and of the organization that binds them together.

"My method of investigating an industry thus begins with a diagnosis of the possible diseases of the human elements in charge of the industry. When this is finished I then take up the material elements, of which the general headings on the list are: Product, location, process, buildings, machinery, power, organization, statistics, finance.

"Besides my work with Blank & Co., I have

been called in, as you have been informed, to help four other concerns out of trouble, and in all four cases I have been reasonably successful. I had no special knowledge of any of these businesses. I simply used the method of diagnosis that I have described, called in specialists for advice when they were needed, including skilled accountants and statisticians, as well as machinery experts, and made a written report of my conclusions and those of my expert assistants. Now if you wish me to tackle your concern in the same way, I am ready. I make no guarantee or promise that I will be successful. When I was a doctor of medicine, I did not cure all my patients. But I warn you that my first work will be a psychological investigation of the board of directors, and after that of the general manager and the superintendents. It will be a thorough hunt for the microbes."

The chairman of the board replied, "I think we are all favorably impressed with what you have told us, but as one of the microbes that you have named, recklessness, is one we especially wish to avoid, we wish to get an idea of what this investigation is going to cost. What are your fees and those of your assistants?"

The "diagnoser" replied, "When I was a doctor, I had the habit of charging what the market would bear; that is, I charged rich patients more than poor

ones; so before I answer your question, I would like you to tell me at what price you value your stock." The chairman replied, "We all paid par for our stock, and on the basis of last year's report we think it should be worth 120, but since the future market conditions do not look favorable, perhaps it is not worth over 80. In fact, I would be glad to sell out at 80." To this the diagnoser answered, "I cannot fix a definite charge for my services because it is impossible for me to know how much work I shall have to do, nor can I form any idea of what the value of my work will be to you when it is done. I do not charge a per diem fee. When I was a doctor I sometimes got $2 for attending to a case three miles out in the country, and I have got $500 for one hour's time on a major surgical operation. I will make the same proposition to you that I made to the last three concerns that I treated. It is this: That you contract to give me an option on 20 per cent of your whole capital stock at 90 per cent of the par value per share, the option to be exercised by me at any time within two years. If I take the shares and pay for them, my fee is the increased value of these shares above 90 per cent at the time that I take them. If I don't take the shares, then my fee is nothing."

After some discussion of these terms, they were accepted and the doctor said he would like to meet

the directors on a certain day of the next week to begin his psychological investigation. In the meantime he gave them a list of questions that he wished them to answer concerning the "microbes" that might possibly affect the personnel of the concern. He asked them to meet together before he met them and agree upon written answers to these questions so as to save time which might be taken up in vague discussions. He also asked them to prepare a statistical statement of the sales in each month of the last two years of each branch of their product and a statement from the sales manager as to the expected sales in each month of the coming year (*a*) on the basis of the rival not having entered the market, and (*b*) on the basis of the rival having entered the market and doing his best to make sales.

At the meeting the following week the written statements were presented. The reports about the microbes were as follows: (1) Conceit.—"We don't think we know our own business, in fact, we know that we don't know it. The founder of the business, who knew all about it, is dead. We got into the business as investors, knowing approximately nothing about it. We have had to depend on our general manager for information." (2) Ambition.—"We do not think we are afflicted with that. We would be satisfied with a reasonable growth of the business and moderate dividends." (3) Inertia.—"We plead

guilty. As long as the business seemed to be progressing steadily, we did not take the trouble to find what our rivals were doing." (4) Recklessness. (5) Fickleness. (6) Stupidity. (7) Nepotism.—"If we have any of these microbes, we are not aware of it."

The diagnoser, after reading this report, said that his psychological investigation of the directors was now complete, and he believed that they had properly diagnosed their own case and that the microbe was inertia. "Now I want your opinion of the general manager," said he. "The general manager," said the chairman, "is a man whose mind runs on one track. We believe him to be an excellent man in everything relating to the factory. He is careful about purchasing; he has a thorough system of cost accounts; he has, we believe, the most modern and best machinery and the latest notions about scientific management, such as the planning room and functional foremanship. We had a scientific management expert here recently who told us that everything was working admirably. We do not think the man could be improved on as a factory man, and he gives us no trouble whatever. His reports to us each month are clear and precise and they check up with the statistics of the accounting department, but the man seems to have no notion of how to push the selling department. He trusts entirely to his salesmen, and we have never known him to originate a new

selling idea." The general manager was then brought into the conference, asked a lot of questions, and proved himself to be just the kind of man the chairman of the board had described him to be. He was then asked the questions, "Is your factory properly adapted to the work that is done in it? Is it of the right shape, size, arrangement of rooms? Is it properly lighted and heated, and have you proper facilities for moving materials around the factory?" To all these questions he replied, "Yes." The factory was new, built according to the latest ideas, and he could not suggest any improvements that it needed. The power plant and methods of transmission of power were also all that could be desired. The next question was, "Is the factory suitable for any other kind of manufacturing business?" "Why," said he, "it is suitable for almost anything. It is three stories high, with 14 feet clear distance between floors, unusually well lighted on all four sides, has heavy and substantial floors, and almost any light manufacturing business could be carried on in it." He also reported that the machinery was all up-to-date and was in good condition. The next question was, "Have you any statistics of the load factor of each of your machines?" He replied, "I don't know what you mean by load factor." "By load factor I mean this: Your working time is 10 hours a day, say 250 hours per month. If a certain machine

runs 250 hours in a month or 10 hours every day in a month, then its load factor is 100 per cent. If it runs only 125 hours in a month of 250 working hours, then its load factor is 50 per cent, I would like to have a statement concerning each of your larger machines as to what its load factor was each month during the past year. Can you get me the figures?" The manager replied, "I have not got the figures in just that shape, but they can be compiled from the time cards, as each time card shows the number of the machine and the number of hours it ran on each job. By adding these figures together on an adding machine we could, no doubt, get up a load factor statement such as you desire." He was then instructed to get up this statement and have it ready within a week.

The doctor then took up the question of the extent of market of the product, and he found a lack of systematic knowledge as to the total demand of the country for the kinds of goods produced, and consequently a lack of knowledge as to what prospects the factory would have of increasing its sales if prices were reduced or if greater activity was put into the selling department. He then told the directors that as soon as they could give him any light on this subject, he would start an independent investigation, using outside business experts for the subject, so that he could form an idea as to the market con-

ditions, and appointed a day, two weeks removed, for another meeting. "Meantime," said he, "I am going to give you another list of questions for you to answer. First, what is your product? Describe its several varieties, shapes, etc. Second, why do you make this product? Why not make something else? Why do you not concentrate and make fewer varieties? Why do you not expand and increase the number of varieties? Why do you put so fine a finish on your goods? Would not a cheaper finish and lower price increase the sales so as to bring more profits? Why do you not improve the quality of the products and get a higher price for them and a better reputation in the market, which will increase the sales? Have you considered what other kinds of products might be made in your factory in order to increase its load factor, especially in the seasons when it is running light? Have you considered whether or not the space available in your factory is fully utilized, or whether or not from two to four times its present product could not be turned out without increasing either the floor space or the power plant? While you are preparing the answers to these questions, I will be studying such other matters relating to the business as may occur to me, and prepare another set of questions which I will give you at your next meeting."

The meeting then adjourned.

CHAPTER III

The Diagnosis; The Factory

THE next day the "diagnoser" called the general manager on the telephone and asked him when it would be convenient for him to have an hour's conference in regard to the factory. The conference was held that afternoon. After some general conversation on the nature of the business, the reputation of its products, its history and its prospects, the doctor said: "It appears to me that your condition is about that of a famous athlete whom I treated some years ago, who was preparing himself for a great contest. Physically he was about 95 per cent perfect, and mentally about 90 per cent. It was necessary to get him up to 98 per cent in both if he was to beat the world's record. In examining him I took nothing for granted. I assumed the possibility that weakness might exist in any one of his muscles or organs, and that any one of the hundreds of causes of lack of physical or mental perfection might also exist. I sounded him from his scalp to his toes, I took his pulse, blood-pressure, respiration, and reaction time. I looked into his eating, sleeping, exercising, training, and all his habits. I got all the

subjective as well as the objective symptoms, and I applied to him all the psychiatric tests that are down in the books. When I got through with the examination I had found very little that was wrong with him; a little overtraining, some errors of diet, slight fatigue-poisoning and the like, and the mental or psychical defects and subjective symptoms, such as alternations of fear and of overconfidence, nervousness, lack of will-power to draw on his reserve of energy or "second wind," were all accounted for by the fatigue-poisoning. I got him up to 98 per cent and he beat the record.

"In my investigation of this business I wish to take nothing for granted. There may be very little wrong with it, but we must examine every organ of every department, no matter how much confidence you or the directors may have in its perfection, to see if there may possibly be anything wrong with it. From what I have already learned it seems probable that I shall find little if anything wrong with the factory or with the method of conducting operations in it, but to remove all doubts on the subject I wish to investigate both the factory and the methods of operation. I have here in my notebook a list of over a hundred separate items; some relating to the production and some to the accounting and sales departments, each one of which I wish to consider before the next meeting of the directors. I will take up the

factory items now, and you will assist me greatly if you can give me brief answers to the questions I shall ask concerning these items.

"First on the list is the location of the plant. Is it a proper one, considering its nearness to and facilities for getting the raw materials, the supply of skilled and unskilled labor in the immediate vicinity, good climate and comfortable homes and cheap markets for the workmen, so that you can secure and keep the best grade of workmen, nearness to the market for your products and favorable freight rates to more distant markets? Are any of your competitors likely to find a better location?"

A few minutes' talk on these questions satisfied the doctor that the location was an exceptionally good one.

The next set of questions related to the buildings. The general manager was asked to furnish a blueprint showing the ground plan and sectional elevation of the buildings, with a statement of the floor area of each department, and to answer some questions relating to the suitability of the buildings to the work now done in them and to other kinds of work which might be done in the future; also as to the extent of vacant space as yet unoccupied in the several rooms, as to the prospect of utilizing this space, and as to the possible need of extra space for future extensions. Other questions related to the lighting, natural and

artificial, of these rooms, the heating and ventilation, protection against fire and other accidents, sanitary appliances, first-aid hospital, rest-rooms for women, etc. The answers to these questions led to the conclusion that the buildings, their arrangement, etc., were almost ideal for the purpose for which they were now used, and suitable for almost any light metal-goods business, but that at present they were much larger than the present extent of the business required, and on this account cost more for heating in winter-time and involved a larger investment of capital than would a building of a size better proportioned to the present extent of the business. They were, as the manager said, built with a view to doing in them a much larger business, which was expected in the near future.

"I understand," said the doctor, "from my conversation with the board of directors, that the business is likely to meet a great deal of competition next year and that prices will be lowered. In that case, there is likely to be more idle time for machinery and less call for utilization of the vacant spaces than there now is." "That is exactly the case," replied the general manager. "Well, what provision have you made against that state of affairs?" "We have made none as yet," said the manager; "that is what we are now getting ready to consider." "Have you

made any investigations in regard to finding out what other lines of products the factory might engage in?" "No, I have not," said the general manager. "Well, let us pass that subject for the present and we will take it up at the directors' meeting. Let us now consider some of the other things on my list. The next is organization. I understand that you have the usual organization of directors at the head, then you as general manager in charge of the whole business and reporting only to the board of directors; that you are in charge of the selling and accounting departments as well as of the factory, and that all superintendents, foremen, sales agents and salesmen are directly in your charge." "That is the case," said the general manager.

"The next subject I have on my list is Material, with these items under it: Purchasing department; purchasing system; specifications, inspection and tests; keeping track of markets and quotations; scrap, disposition of; by-products, utilization or disposal of; origin and handling of requisitions. The next subject is Stores and Supplies, and under it I have: Duties of stores clerk; inventory of supplies; minimum quantity allowed before ordering new supplies; bins, shelves, facilities for handling." These subjects were discussed at some length and the doctor expressed his satisfaction with this branch of the management.

"The next subject on my list is Men, and with the following items: Selection and hiring of men; fitting men into the right places; promotion; training of young workers; training of leaders; management of green workers; incentive; discipline; accident insurance; prevention of accidents; human welfare." The manager showed that he was quite up-to-date in all these matters and promised at the next opportunity to take the doctor around and show him in detail just what was being done in regard to the treatment of men and the incentives offered them to remain connected with the concern.

"The next subject on my list," said the doctor, "is Scientific Management. What have you to say about that?" "Why, that is my hobby," said the general manager, "I was with Fred. Taylor at Bethlehem and got a good training under him, and have kept track of his work and with that of Gantt, Barth and Hathaway ever since. I meet them occasionally and they post me as to their most recent ideas. We had an advantage over most concerns in installing scientific management, for we started it when the first designs were made. We located on the original plans the tool room, store room, and planning room, laid out the course of material from the receiving platform to the shipping room, and planned the means of handling it by cars, cranes, elevators and trucks so that it could be handled with a minimum

of manual labor. If you wish to take the time now I will go into detail in regard to the management of the production end of the business."

"We will postpone that for the present," said the doctor, "but I wish to check off the items I have listed under 'Scientific Management inside of the shop' to see if you have all these items: Planning room; tool room; tool grinders; messenger service; standard shapes of tools; functional foremen; routing man; disciplinarian; time study; motion study; instruction cards; standardized operations; mnemonic symbols; fatigue study; task and bonus; statistics and plotting of results, graphic daily balance."

"We have all of these and a few more," said the manager, "but these are only the machinery of scientific management; the real essence of it is a mental attitude, a state of mind, a disposition which is not satisfied with the possession of mere machinery of a system, but is always watching to discover something that can be improved. There are two things you had better add to your list, doctor, the effect of scientific management upon the earnings and upon the general welfare of the men, and its effect upon the cost of production. If it does not both increase the men's earnings and decrease the total cost of production at the same time, then it is not fulfilling its function. I shall be glad to show you our plotted results on these two items, and I think you will find

that at least we are making progress in the right direction, and I would like you to compare our results with that of any of the manufacturing concerns that you are interested in." "Well, you are a 'crack-a-jack' scientific manager," said the doctor. "I am going to put you in touch with the managers of the other concerns in which I am a stockholder, and if you don't learn something from them, they, I am sure, will learn something from you.

"The next subject on my list is Power Plant, with the items: boilers, engines, condensers; electric generators, heating system, lighting system; cost of fuel, efficiency of the plant and of its several items; water evaporated per pound of fuel, pounds of steam per horsepower per hour at minimum, peak and average loads; load diagrams, summer and winter; water and steam records; distribution of power by belts, shafts, electric current; motor efficiency at actual loads, lubrication, roller bearings, total cost of power per year; items of possible saving. Will you ask your chief engineer to give me a report on these items, and also any criticism he may have to make and any improvements he may suggest which may reduce the cost of power or keep the machinery running constantly at proper speeds?"

The manager said, "I will do so. No doubt you will find many things that are wrong in our power plant. It was the one thing in which the original

owner of the plant tried to save money. We have a non-condensing engine, an old-style boiler with too small a combustion chamber, and are making lots of smoke. I suppose if we had a condensing engine, mechanical stokers, a CO_2 apparatus, a steam meter, and a coal weighing apparatus we might save 30 or 40 per cent of fuel, but we have postponed consideration of these matters until we get other things straightened out first, which seem to be of more importance. If business is dull next year we may not feel like spending any money on improvements." "Quite right," said the doctor. "If your fuel bill is only a small fraction of your total expenditure, and there is a possibility that you may not need a power plant at all if you can buy power and light cheaply enough from a central station, which will also heat your buildings with its exhaust steam, it is well to postpone the power plant question.

"The next thing on my list," said the doctor, "is Designing and Drafting, with these items: Chief draftsman, assistants; designing and drafting methods; photographing; recording and filing; statistics of special orders; conferences on new designs and improvement of old ones; cost of department; results produced by it. What can you tell me about this department?" "Well," said the manager, "it is about like the factory, very good in its equipment, plenty of system and red tape, records and methods

all right, but the results we get from it are not proportionate to its cost. The chief draftsman and designer is a very able man, and he could handle a large corps of assistants well, but we have not enough new work on hand to keep many men busy in that department, so he spends a great deal of his time doing what a much cheaper man could do. We cannot well dispense with him, for he is thoroughly acquainted with our business, and we occasionally need his high grade of skill on special orders. I wish you would suggest some way of improving that department so that it could be made to pay for its keep." "I will make a memorandum of that," said the doctor, "and look into it later."

CHAPTER IV

The Accounting and Sales Departments

"THESE are all the questions I have to ask at present concerning the production departments," said the doctor. "I have only one other memorandum on my list for today; it relates to the accounting department. Here it is." The doctor handed the manager the paper, which read as follows:

Accounting system: Does it give the manager the information he should have in regard to the distribution of the active working capital among the several items: cash; bills and accounts receivable; finished goods in warehouse and on consignment; raw material on hand; work in progress; also as to advance insurance premiums; advance advertising for next year's business; proportion of this year's expense chargeable against next year and succeeding years; change in value of fixed capital due to depreciation and obsolescence? Are the books examined and reported on yearly by a professional accountant? Is there a chart with entries made each month showing the expenditures for material, labor, general factory expense, advertising and other expense of the sales department, sales, cash receipts from sales, cash on hand, bills and accounts receivable, bills and

accounts payable, surplus available capital to meet possible slackening of business or slow collections? Is there a similar chart showing what is expected in each of the above items for the next six to twelve months, for the purpose of aiding in reaching a decision as to whether expansion, with increasing expenditure, "standing pat," or "shortening sail" is the proper course to pursue?

In reply the manager showed the doctor the books and monthly statistical records and charts covering all the items asked for and some additional ones, also the last report on the accounts by a firm of chartered accountants, and two charts, one showing the history of the business, month by month for two years, and one showing the future prospects as well as they could be prognosticated. In relation to the last the manager said, "At the last meeting of the directors we studied this chart and came to the conclusion to 'stand pat,' or 'let well enough alone.' We saw no reason for either shortening sail or expanding, and we have not enough capital to go into any extensive experimenting. As we had to borrow some money last year to meet the natural expansion of the business, we concluded to let the whole of last year's net earnings remain as working capital, and not to declare a dividend." "A very wise conclusion," said the doctor.

"At that meeting, however," continued the man-

ager, "an unexpected situation arose—that of the impending competition and consequent curtailment of our market—and for that reason you were called in as adviser. There is another matter that I wish you would consider also, that is, what we shall do in view of the threatened reduction of the tariff on our product? Just now we have the whole domestic market, but if we have to divide it with the Germans as well as with our American rivals, I don't know what is going to become of us." "I am studying these questions," said the doctor, "and I will have something to say about them at the directors' meeting. Now, before I go, I am going to leave with you two papers containing a lot of questions which I wish you would answer as well as you can to-morrow afternoon, when I hope to have another talk with you." The first paper contained the following:

Duties of the president and of the directors. How do they fulfill their duties?

Relation of the directors to the manager. Are they satisfactory?

Organization of the sales department. What are the methods of distributing the product, and what is the efficiency of each method? Wholesaling, jobbing, retailing; branch offices, local agents, exclusive territorial agents; trade agreements and contracts; re-sale prices, discounts, rebates. Advertising, correspondence, bulletins, circulars; department stores, mail orders.

Statistics of sales and of costs of selling, by different methods, by months, by districts, and by classes of product.

How is the selling price, wholesale and retail, determined?

Who or what determines the method of selling, the selection and appointment of salesmen, the salaries and commissions?

What system have you for training salesmen? Do your salesmen stay with you, or do you frequently have to get new ones?

What methods are in progress, or in prospect, for increasing the efficiency of the selling department, both as to increasing the volume of goods sold and as to decreasing the cost of selling?

What are the limitations to the quantity of goods that can be sold? Can the market be developed so that it will be large enough to afford both yourselves and your competitors a chance of doing a large and growing business?

What proposal have you to make regarding ways of meeting the expected competition next year, and what for filling the factory with other kinds of work in case the competition cuts down the volume of sales of your present products?

The second paper was a printed one,[1] which the doctor had used in another factory, and it contained the following:

[1] "Academic Efficiency," by William Kent, in Proc. Soc. for Promotion of Engineering Education, 1912, vol. 22, part I; also in *Science*, Dec. 20, 1912.

When an efficiency expert begins his operations in a factory his first questions are: What kind of product is made? Why is it made? Why not abandon it if it is not profitable? The next set of questions covers the quality. Is the quality too highly refined and too costly, so that its market is limited? Is it too common and cheap, so that it has to be brought into competition with the poorest goods on the market? Is it out of date and unfashionable? Is the quality what it ought to be, and if not what are the reasons, and how can it be improved?

Next come questions as to quantity. Is the factory turning out too much of one kind of goods, so that the market is glutted and the price too low? Is it turning out too little, so that it is not doing as much business as it might do? Is it turning out too much of one kind and not enough of another; and if so, what changes should be made so as to establish a proper balance?

After these questions of kind, quality, and quantity of product are considered, then comes the question of cost per unit of product and of possible methods of reducing that cost. In the factory the solution of these questions is one of great difficulty and complexity. It includes the items of location, buildings, machinery, system of organization, functional foremanship, statistics, accounting, planning of work, routing it through the shop, methods of payment of wages, keeping high-priced men only on high-priced work and finally time study resolved into its elements, that is, motion study. I quote from Frank B. Gilbreth's new book on Motion Study. [The words in brackets are not in the original]:

"There is no waste of any kind in the world that equals the waste from needless, ill-directed, and ineffective motions [true of the sales department]. . . . Tremendous savings are possible in the work of everybody—they are not for one class, they are not for the trades only; they are for the officers, the schools, the colleges, the stores, the household, and the farms. . . . It is obvious that these improvements must and will come in time. But there is inestimable loss in every hour of delay. The waste of energy of the workers in the industries [and in the sales department] today is pitiful. . . . In the meantime, while we are waiting for the politicians and educators to realize the importance of this subject and to create the bureaus and societies to undertake and complete the work, we need not be idle. There is work in abundance to be done. Motion study must be applied to all the industries [including the sales department]:

"1. Observe the best work of the best workers.

"2. Photograph [and 'dictagraph'] the methods used.

"3. Record the methods used.

"4. Record outputs.

"5. Record costs.

"6. Deduce laws.

"7. Establish laboratories [and tests] 'for trying out laws.'

"8. Embody laws in instructions.

"9. Publish bulletins [for salesmen].

"10. Co-operate to spread results and to train the rising generation."

Mr. Gilbreth refers to motion study of the in-

dustries that are producing material wealth, but his words may be applied to the industry of [distributing and selling goods].

Mr. Harrington Emerson has written a book entitled "The Twelve Principles of Efficiency." He wrote it with especial reference to the efficiency of manufacturing establishments, but the principles may be applied to [the sales departments]. They are the following: (1) Clearly defined ideals. (2) Common sense. (3) Competent counsel. (4) Discipline. (5) The fair deal. (6) Reliable, immediate and exact records. (7) Despatching. (8) Standards and schedules. (9) Standardized conditions. (10) Standardized operations. (11) Written standard practice instructions. (12) Efficiency reward.

The next day, an hour before the time appointed, the doctor appeared at the factory with a companion, whom he introduced as a mechanical expert whom, he said, he wished to take through the factory. The manager excused himself from accompanying them, on account of the press of other matters, and said they could go ahead without him. The doctor took the expert first into the assembling room and then into the finished stock room, explaining to him the different products, and finally into the drafting room, where he introduced him to the chief draftsman. "Are you," said the expert, addressing the draftsman, "responsible for the design of these machines?" "No," he replied, "the main designs were made before

I came here, but I have designed some slight modifications, and some special tools for the cheapening of their manufacture, under the directions of the general manager." "It appears to me," said the expert, "that the machines are admirably adapted for their purpose, that they are strong, durable, with bearings well proportioned, and with an excellent system of lubrication, but that they are not designed with reference to the cheapest system of manufacture. Here are three castings, carefully fitted, doweled and bolted together, that might better be made as a single cored casting. Here are small castings that need a great deal of work on them to get them true to size, that might be replaced to advantage with drop forgings. I noticed in the factory also that many parts are being made on turret lathes, involving great expense for such a variety of turning tools, and necessitating frequent changes of setting, because these parts are made in small quantities at a time. Many of these parts could be purchased at low prices in the market from manufacturers who have automatic machines, as they are standard shapes that are used for other purposes by the thousand. What do you think about these matters?"

"You are entirely right about all of them," replied the chief draftsman, "and I have brought them to the attention of the general manager, but he said, in regard to the larger castings, that he did not want to

go to the expense of scrapping the old patterns and making new ones with expensive core-boxes, and as to replacing the smaller castings with drop forgings, that would involve considerable expense for making dies. It would look bad on the cost accounts, he said, to charge off total depreciation of these patterns after they had been in use such a short time, and to increase the tool account by the cost of these dies. As to the turret-lathe work, he said no doubt he could buy parts made on automatic machines more cheaply than the total cost of making them in the factory if they were charged with their regular proportion of burden or general factory expense, but if they were not made in the factory, the turret lathes would be idle, while the expense of keeping them idle would be almost as much as that of keeping them at work."

On returning to the office the doctor and the expert had a conversation with the general manager in regard to the matters talked of in the drafting room, and he confirmed what the chief draftsman had said. It appeared further that the general manager had not made any detailed study or estimate of the cost of making new patterns and dies, or of the saving that might be made by purchasing parts made on automatic machines. His decision in regard to them was based on his "judgment," and was not the result of investigation.

The expert then left, after being informed that his

services for a detailed investigation might be called for at an early date. The manager then said he was ready to reply as best he could to the questions, written and printed, that had been given to him the previous day, but was sorry that he could not give definite and satisfying answers to all of them. In regard to the duties of the president and directors, he said that nominally their duties were to have general charge of the whole business and to direct him what to do. Practically they fulfilled their duty by telling him to go ahead and run it and report at each of the monthly meetings what was done or being done. His relations with them were perfectly satisfactory. They trusted him in everything and only asked him for results. Not one of them had any expert knowledge of the business, and each of them had business enough of his own, grocer, real estate man, insurance, and the like, so that he could give but little time to the factory business. He would like it better, he said, if one of them had been a manufacturer, or even a man in the wholesale or jobbing business, so that he could get some points on the art of selling, in which he confessed himself a novice.

As to the organization of the selling department, he said it was quite simple, he hired the traveling salesmen; there were three of them covering the whole country, and he had an excellent chief sales clerk and correspondent, who was practically a sales

manager in all but the name and in the power of deciding on the policy of the sales department, which he reserved to himself. His clerk kept complete statistics and charts of sales and prospects.

As to wholesaling, jobbing and retailing he made a statement as follows: "Here is a machine, on which we have fixed the selling price to the final purchaser at $100, no discount, this being as high as we think the market will bear. Our factory cost estimate for this machine, based on 2000 made per year, is as follows: material, $15; labor, $10; factory expense, $15; total, $40; based on 1000 made per year: material, $15; labor, $11; factory expense, $19; total, $45. On making a canvass of the wholesale, jobbing and retail trades concerning their handling these machines by buying a stock of them and selling them, here is what we found: The average retailer thought he could not dispose of more than three a year, and to pay him for carrying them in stock he could not pay more than $75 for them, so that his margin would be 33⅓ per cent, or $25. The jobber, who would canvass the retail trade, wanted 25 per cent, which would make the cost to him $60. The wholesaler selling to jobbers at $60 would want 20 per cent profit, making the cost to him only $50. On being asked what they could do in the way of advertising and pushing the goods, both wholesaler and jobber said they would print cuts of the machine

in their catalogs, and issue leaflets to their trade, and their salesmen would have it on their lists; but, said they, 'You must create the demand, and pay for the newspaper advertising. We handle staple and well-known goods, and we sell what people demand, but the manufacturer is the one who must give publicity to his own goods.' As the machine would cost us not less than $45 delivered at the factory, if we made 1000 of them a year, or $40 if we made 2000, and it might cost us anywhere from $10 to $20 for expense of advertising, salesmen, and collections, there was no money in it for us if we distributed the goods through the regular channels. Here is a point on the 'high cost of living': material, $15; labor, $10; factory expense, $15; total, $40; paid by the 'ultimate consumer,' $100; cost paid by the consumer for getting the machine from the factory into his hands, $60; profit to the factory, nothing. On this account we concluded to offer the machine to the wholesaler, jobber and retailer on our terms and not on theirs, and to treat all of them alike. If any of them sent us an order for one machine we would bill it at 15 per cent discount, 20 per cent for two machines, 25 for three or more. We have advertised extensively in the technical press, and by circulars sent to a selected list of possible customers, and our three traveling salesmen have canvassed the country quite thoroughly. We have

no branch offices, and no local or territorial agents, but are ready to establish agents when any one comes along with sufficient inducements in the way of capital. We sell the goods to any one who calls for them, and we have nothing to do with re-sale prices, trade agreements, special discounts or rebates. We think the results of this method of handling the business have been fairly satisfactory, and last year we made a fair profit on these machines. As to the other sizes of machine the story is practically the same.

"As to methods of training salesmen, we have none; we were lucky enough to get good ones, we pay them well, part salary and part commission, and we have been able to hold them. I cannot say that we have considered any method of improving their efficiency.

"As to limitations of the quantity of goods that can be sold, there certainly are narrow limitations. Our machines are special ones, used only in certain factories. They are not like automobiles, sewing machines and typewriters, that appeal to the general public. We cannot count on there being more than 5000 possible consumers for our products in the whole country, and we think we are reaching them all by our salesmen, advertising, circulars and correspondence. Unfortunately for us, our machines do not wear out, and this fact restricts the demand for them. I do not see any possibility of there being a

big enough market for both ourselves and our expected competitors. I have no proposal to make as yet, as to ways of meeting competition; in fact, I did not expect it, and have not given thought to the subject. I am looking to you and the directors for proposals.

"As to the questions on your printed paper, 'What product is made?' That you have already seen. 'Why is it made?' Well, because we got started that way and have just kept on. Why did we start that way? Probably because of some one's judgment that the business would be a good one. Perhaps too much optimism, faith, confidence, enthusiasm, all good qualities, and those upon which civilization and prosperity advance. These are the qualities we must continue to have if we are going to get out of the difficulty that confronts us, but I see that they are not enough. We must add to them knowledge and foresight of business conditions. I see the drift of your printed paper. It is not enough to have scientific management inside of the factory, we must have it outside, in the selling department; we must have research and investigation not only as to how to sell the goods that we make, but as to whether we ought not to make and sell something else, and as to what that something should be. Now I am going to confess to you my limitations. I know a lot about factories, and about scientific management of them. I have

had good luck, I call it nothing else, in getting salesmen. I think I have made no mistake in our selling policy, but when it comes to originating plans for a new business, requiring foreknowledge of business conditions, I am all at sea. That is out of my line. I think it is your line, and I am looking to you to get me out of this hole."

"I am very glad you told me all this," said the doctor. Confession of ignorance is the beginning of wisdom. It is a wise man who is aware of his ignorance. Such a man is the born investigator, the man who with proper training is fitted to become a scientific manager, or at least a scientific manager of one department of a business. No one man is such an all-around genius that he can be a scientific manager of everything. The conclusion of this preachment I will postpone until I have had a talk with the directors."

CHAPTER V

The Doctor's Preliminary Report

THE meeting of the directors was held on the appointed day, and the doctor gave them a long talk about what he had found out in his visits to the factory and in his conversations with the manager, the chief draftsman and the mechanical expert. "To save your time," he said, "I will read from my memorandum book a few brief notes on some of the principal branches of my investigation which appear to need no further consideration at the present time, and then I will take up the symptoms that are in need of treatment.

Location, ideal.

Buildings, ditto, but larger than needed for present extent of business.

Equipment, excellent, suitable for a great range of light metal products.

Machine load factor in month of maximum output, 53 per cent based on number of machines, 42 per cent based on machine-hour rate. Average for last 12 months, 44 and 32 per cent.

Power plant, good, but old style, underloaded, and uneconomical.

Designing and drafting, high-priced man on low-priced work; not enough new work for him.

Management, inside the factory, thoroughly modern, Taylor system; outside, traditional, old-fashioned.

Product, quality excellent; demand restricted; variety too large, smaller sizes of some styles might be abandoned; design of some parts might be improved so as to lessen manufacturing cost a little.

Accounting system, excellent; good charts of results.

Sales departments, suitable for present extent of business, but not the best for enlarging the business.

"We will pass for the present all these items and come to others which are of pressing importance:

Organization. Suitable for the present business in good times; not adapted to cope with new problems. Manager a good autocrat, a benevolent despot, a thorough factory man; his mind runs 'on a single track,' inside of the factory.

Prospects, ruinous competition ahead, with no plans for meeting it.

Finances, ample for a steady prosperous business; some reserves to meet ordinary business depression, but none to spare for revolutionary changes or hazardous experiments.

"Now," said the doctor, "I have diagnosed the symptoms of the patient's disease. It is a case outside of the range of my previous experience as physician of lame businesses, and is not considered in the books of Dr. Taylor or of any other writer on scientific management. I have heard of many similar cases, however, and I judge that the percentage of mortality

in these cases was about 50. Of those that survived the majority had a severe struggle, many of them with assessments of stockholders, or issuing of bonds, while others seemed to come through more by luck than by good management. I know of no specific or panacea for the trouble. The usual method of treatment is for some one to guess at a remedy, and then it is tried. It may work and it may not.

"When I was a doctor of medicine I used to keep in my note book a list of old proverbs or maxims, which often in times of doubt suggested an idea. Such were, 'A burnt child dreads the fire.' 'Fire is a good servant and a bad master.' 'What is medicine for one man is poison for another; ten grains of blue mass will cure a mason of fever—but will kill a tailor.' When I became a diagnoser of sick businesses I collected a lot of maxims which seemed appropriate. I will read you some of them. You will notice that some of them seem to contradict others."

Competition is the life of trade.
Competition leads to consolidation.
A penny saved is a penny earned.
Hold a penny too close to your eye and you fail to see the dollar beyond it.
Save at the spigot and waste at the bung.
It never pays to milk mice.
Young men for action, old men for counsel.
In the multitude of counselors there is wisdom.
Too many cooks spoil the broth.

"The last two maxims are not really in opposition, although at first sight they appear to be. If you want a good apple pie made, one good cook can make it without any advice; but if you ask him to make a mutton pie he may say that he has never made one and that he wishes to take counsel of other cooks before attempting it. Notice that he wants the counsel of experts, not of any Tom, Dick or Harry who may volunteer to give advice. The counselors must be selected. Notice also that when he gets the counsel he does not ask any other cook to help him make the pie, he makes it himself.

"So in this business you have one cook, the general manager, but he has had no counselors. He is a good cook, within his limitations, which are the four walls of the factory, but he is not a good cook beyond these walls, in the selling department, especially when it is facing a dangerous situation. What we need immediately is several expert counselors, and I think I know where to get them. Call in from the road your three chief salesmen and ask them for their advice. We may find that one of them can give us the correct solution of the problem, but if not, the discussion with them may give one of us an idea which may lead to the correct solution. In order that they may come to us with matured thoughts upon the subject, I have drafted a letter to them which will set them thinking. I will read it to you."

Dear Sir: We have called a joint meeting of our directors and of our whole selling organization, to be held on 20th and 21st inst., beginning at 10 A. M. each day, for the purpose of considering the impending competition in our business and deciding what steps should be taken to meet it. Please be present without fail, and come prepared to give us the benefit of your advice, and we would prefer that you mail to us your views in writing on or before 15th inst., so that the directors may discuss them in advance of the meeting.

The facts of the case are as follows: The first year after building the factory and installing the present management, our total sales amounted to $350,000; costs: factory, $260,000; sales department, $105,000; net loss, $15,000. The second year the sales were $700,000; factory cost, $456,000; selling cost, $175,000; net gain, $69,000. The business the first three months of this year indicates that the results of the whole year's business will be about the same as those of the past year unless sales decrease. That they will decrease is practically certain. Another concern is going to make the same goods and we will no longer have a monopoly. It can make the goods at about the same factory cost as ours, and it will have an advantage over us in cost of selling, which advantage we estimate at about ten per cent of the gross price, due to the fact that it will handle the goods as a side line through its several branch offices and will utilize the newspaper space it has already bought for its other lines. A few extra leaves in its quarterly bulletin will soon inform all our customers that it is competing with us.

Unless the demand for these goods can be increased, this competition will probably cut our business down one-half, and the result will be to reduce our profits to nothing, even if present prices are maintained. If the prices are cut ten per cent, and selling expenses are as high as they now are, our business will show a loss.

The following suggestions have been made by some of the directors merely for the purpose of discussion, and we give them to you that you may think them over and give us your views on them:

1. Discourage the rival by cutting below his prices.
2. Consolidate with him.
3. Offer to buy his patterns and have him agree to keep out from our lines.
4. Extend the market by more advertising and by the employment of more agents and salesmen.
5. Try to get a foreign market.
6. Cheapen the cost of manufacture; especially reduce the overhead charges of the factory.
7. Keep on as we are, expecting that our reputation will bring us the bulk of the trade.
8. Find some other thing to manufacture.
9. Reduce the fixed charges of the sales department; this involves our dispensing with at least one of our high-priced salesmen and appropriating less money to advertising.

Please put in writing your views as to each of the above suggestions, and if you have any suggestions of your own to make we would like to have them in advance of the meeting so that we may have time for their consideration.

If you favor suggestion No. 8, that is, finding some

other thing to manufacture, in addition to our present product, please state what thing or things you would advise us to make, and give any figures you may have concerning the extent of the demand, the selling prices, discounts, costs of selling, and methods you would propose for handling them.

Please acknowledge receipt by wire, stating when you will start for home.

The letter was at once approved and ordered to be typewritten and sent to each of the three salesmen. The doctor then said: "I have a lot of suggestions of my own as to what had best be done to prepare for the expected competition, but I prefer to withhold them until I have met your salesmen and get acquainted with them. In the meantime I have a few other matters to discuss. I have been looking over the figures of last year's business, and here is what I find:

Factory cost, labor and material	83.4	
Factory expense	16.6	100.
Selling expense, per cent of factory cost		38.4
Selling expense, per cent of selling price		25.0

"The factory expense, 16.6 per cent, is apparently very low, but it is partly due to the fact that the wages of the functional foremen and of all the factory clerks are included in the labor cost, and are not charged to "unproductive labor," as is the custom with some accountants. I do not think that

the total annual cost of either the so-called unproductive labor or of the factory expense is excessive for so large a factory or for one doing such a large variety of work, except that some saving might be made in the cost of fuel if a more economical engine were installed, and that the high-priced chief draftsman is not turning out work of value proportioned to his pay.

"The chief trouble with the factory is that it has not enough work to do to utilize to the fullest extent either its space, its machinery, or the time of the manager, the foremen and the chief clerk, all high-priced men. The machinery may be working with very high efficiency while it is running, but its average load factor is only 44 per cent, and the average load factor of the capital invested in it, including the space it occupies and its share of the general expense, making the 'machine-hour' cost, is only 32 per cent, on account of the fact that it is the largest and most expensive machines that have generally the lowest load factor, while some of the smaller machines are running from 70 to 95 per cent of the time. If a few more small machines were installed in the vacant space that is waiting for them, the product of the factory might be doubled provided, of course, that the increased product could be marketed. This trouble would cure itself in a short time if business conditions remained normal, with a steadily

increasing demand for the product, but with the new conditions of severe competition it is likely to become more serious.

"The cost of selling is not high in comparison with the cost in some other lines of manufacture under modern methods of doing business with expensive branch offices, whole-page and double-page advertising, extravagant salaries and commissions to agents, and the like, which bring the cost of selling often up to from two to four times the manufacturing cost, but it is high enough to suggest the possibility that it can be considerably reduced. In other lines of business the ratio of selling cost to manufacturing cost varies through an exceedingly wide range. For example, I visited a factory in New England recently and got the price of a special machine used in some textile mills. I was surprised at what seemed to be a remarkably low price, and asked what it cost to sell them. 'Practically nothing,' was the reply. 'Every one that has a need for our machines knows exactly what they are, and also the fixed price, and if he wants any of them he sends us an order; so we do neither soliciting nor advertising.' That is the old way of doing business. If a man wanted a wagon, he went to the wagon maker and bargained for it. Now if he wants an automobile, he sees the flashy advertisements of a dozen of them, writes for the handsome catalogs, is called on by a dozen agents,

representing as many expensive offices on Broadway, is treated to 'demonstrations' by all of them, and finally buys one, paying in the purchase price not only the factory cost plus a reasonable profit on it, but also the cost of competition, which is the 'life of trade,' and which may be equal to or more than the factory cost. This condition of business is all right so long as the extraordinary demand keeps up, but it will end in disaster to many of the makers just as soon as the capacity of the factories is increased to such a point that it is greater than the demand. Then will come the struggle for the survival of the fittest, and the final survivors will be only those who combine a high reputation with facilities for manufacturing at the lowest cost and ample capital to sustain the struggle until the weak competitors are driven to the wall and costs of selling are reduced to a reasonable figure. The history of the sewing-machine business and of the bicycle business will be repeated. There was a time when the price of a sewing machine was $60, which was made up of factory cost $10, cost of selling $30, profit $20. When the price came down suddenly to $30, the factory cost was still $10, and selling cost and profits were reduced each to the same figure. The price of a good bicycle was held for several years at $100, of which $15 was factory cost, $65 cost of selling, including special discounts and allow-

ances made for old machines; profit $20. The price suddenly broke to $50, then to $40 and $30, and three-quarters of the makers either went into bankruptcy, or else raised more capital and went into the automobile business.

"Your business is in no immediate danger on account either of poor factory facilities, high cost of selling, or lack of capital to carry you through a business depression, but if you are driven to extending your business into other lines in order to get work to keep the factory busy, it is of the greatest importance that you select the right thing to manufacture, that you have facilities for making it at least as cheaply as your strongest probable competitor, that it is an article in large and regular demand, not subject to changes in fashion, and that your making it will not tie up your capital in such a way that you have no resources in case of a struggle or financial depression. Your available working capital is not large enough to warrant your embarking in any speculative venture, no matter what may be its promises of large profits, and in the present financial temper of the country it is going to be very difficult to raise additional capital by selling new stock of a manufacturing company.

"I hope to get from our three salesmen some good suggestions as to what other line of manufacture to engage in, but if they have nothing attractive to

offer, then we must start a systematic investigation to find something.

"Your manager has asked me to give you my views as to the probable effect of the threatened reduction of the tariff. Frankly, I do not know what the effect will be, and I think that no one else knows; least of all the leaders of the majority in Congress. The new tariff bill, if it passes in its present shape, is a leap in the dark.[1] It is opposed to the first law of prudence, 'look before you leap.' It appears to be based purely on politics and on guesswork, and not on any kind of scientific investigation.

"Here is what Hon. Wm. C. Redfield, now Secretary of Commerce, wrote a year ago in his 'New Industrial Day,' concerning sudden changes in business:

Any radical change in factory management must be a gradual evolution out of that which has preceded it. The present system, or lack of systems, with their good or bad points, are themselves the result of long evolution. No drastic or radical change in them can be suddenly or even rapidly made without causing disturbance.

"This same Mr. Redfield is now urging a drastic

[1] This statement was printed in *Industrial Engineering* in June, 1913. The tariff bill has since been passed. The leap in the dark has been taken, but at the present date, Dec. 1, 1913, no one knows what the result will be.

and radical change, the reduction of the tariff, and he insists that wages shall not be reduced, under penalty of an investigation by his department. He wants efficiency to be introduced not by gradual evolution but immediately. He said in a recent speech (see New York *Times*, May 15, 1913):

Operating with bad equipment, with unscientific treatment of material, with antiquated methods, in poor locations, with insufficient capital and generally ineffective management, will not be esteemed a satisfactory reason for reducing wages. . . . The stern demand for efficiency as a duty which our industries owe to the public—these are all parts of the awakened American manhood. . . . I believe that a day of freedom has just begun and that we are shaking off the shackles of a real industrial slavery to enter upon the arena of free competition, strong, athletic and vigorous, in which our business will be stronger and safer and in which we shall be happier than ever before.

"Here is eloquence indeed, the American eagle screams, but neither eloquence nor investigations by the Department of Commerce will avail to prevent the reduction of wages if that is necessary to insure that the workmen in our factories are not to be thrown out of employment on account of their work being given to workmen in foreign countries. If the new tariff is low enough to enlarge greatly the importation of goods that are now manufactured here it means idleness for many of our workmen

until other work can be found for them, until they emigrate to find work in foreign factories, or until they accept wages sufficiently low here to enable the goods again to be manufactured in this country.

"Another writer (George F. Brett, in the *Outlook*, May 17, 1913) says:

The effect of the reduction of the tariff, as, at any rate, one business man sees it, will be first of all some reduction in the cost of living brought about by the competition of the foreign producer—and this reduction of prices will not, in my opinion, reduce the wages of factory workers at all, but by bringing about economies in management, by reducing lavish and unnecessary expenditures for exploitation, prove a blessing to the manufacturers themselves.

"The 'high cost of living' has been the chief excuse during the past ten or fifteen years for the increase of wages, which have been steadily advancing since 1898, not even being reduced during the depression of 1907. If high cost of living sent wages up, why should not a reduced cost of living bring them down?

"As far as your own business is concerned, I do not think that the tariff will be reduced on your products to below the protective point, or so low as either to encourage some foreign manufacturer to engage in the manufacture of your line of machinery, or to make it profitable for you to abandon

your factory here and have your goods made abroad; but what I do fear is that the demand for your machines in this country will be reduced, the factories that buy them from you not being likely to invest in new machinery when their profits are tending towards the vanishing point.

"Both on account of the threatened competition from your rival and on account of the threatened reduction of the tariff and its uncertain effects, we must prepare ourselves for the worst. I am going to suggest certain changes in the management of the sales department after we have had a conference with the salesmen, but whatever we do in that matter we must not act rashly. I quote the following from the report of the committee on 'The Present Status of Industrial Management' presented at the 1912 annual meeting of the American Society of Mechanical Engineers, and what is said about management in a plant applies with equal force to management outside of a plant, that is, in the sales department:

The introduction of scientific modern management in a plant must be made slowly. The causes of most so-called failures are principally two: a failure of the executives to acquire the vital mental attitude, and too great haste in application. The latter seems to be the dominant one. The committee feels compelled to emphasize the danger of attempting to hurry any change in the management.

"I may say, however, without waiting for the conference, that the change I have in mind is that of relieving the general manager from all duties connected with the sales department, except that of having a say in regard to whether or not new lines of manufacture shall be undertaken. Of course, I would not wish to make this change without his full consent and approval, and I have not yet planned out the details. When I have I shall have a talk with him about it."

Considerable discussion followed the doctor's long talk, but no fault was found with his views, and it was agreed that no further conference need be held until after the salesmen had arrived.

CHAPTER VI

The Salesmen's Conference

THE conference of the directors with the three salesmen was held on the appointed day. Each had previously sent a letter expressing his views. The first was a long one from Mr. Brown, who had for two years been covering western territory. It may be condensed to the following: His first year's work had been chiefly educational, bringing his goods to the attention of prospective buyers and placing some machines on trial for demonstration purposes and to obtain records of performance. In the second year business had been very good, and, barring competition, he thought there would be three or four years more of good business getting the machines placed in nearly all the factories that needed them. After that he expected that business would fall off, on account of the factories being all supplied, and additional sales would only be made corresponding to the rate of growth of these factories and to the building of new ones. In regard to the expected competition, he said that if the rival house put on the market a line of machines of equal quality and prosecuted an active selling campaign, the

total yearly sales for the two houses together might be 120 per cent of the present yearly rate, of which he would expect that we should sell two-thirds, on account of the good reputation the machines had already made, leaving one-third to the rival house. Two-thirds of 120 is 80 per cent; that is, the present yearly sales would be cut down 20 per cent, with no decrease in the total annual cost in the selling department for salaries, traveling expenses and advertising.

"Price-cutting," he said, "would be suicidal. Purchasers are quite willing to pay the present prices, which are not high, considering the quality of the goods, provided they know that every other purchaser has to pay the same price; but if price-cutting is once started, there is no knowing where it will stop, and customers will delay buying until prices have touched bottom. By that time profits will have vanished, and the best thing that could be done then would be to liquidate the business, selling the factory and stock in trade, including good will, to your rival, who could afford to pay a better price for them than anyone else could.

"The chief trouble with your western business is the high cost of selling. Customers are far apart, traveling expenses are high, and the amount of sales that can be made per thousand miles of traveling and per thousand dollars of other expenses is limited. I could sell five times the amount of goods in this

territory with no more effort than I now make, if I had a great enough variety of goods to sell.

"My proposition in regard to the western country is this: Cut down your expenses of selling by giving me the exclusive agency for all our products west of the Mississippi River. Figure the percentage that last year's selling cost in this territory, including special discounts to dealers, salary, commissions, traveling expenses, circulars, correspondence and postage (but not including newspaper advertising), bears to the list price less regular published discounts, and bill the goods to me at a discount equal to two-thirds of that percentage. That is, on a lot of goods billed at $100 (list less regular discount), if the selling cost last year was $60, leaving $40 to the factory, this year they will be billed to me at 40 per cent discount, leaving $60 to the factory. I can afford to do this because I intend to handle other goods besides yours, which will not compete with yours, of course, and also because I shall watch every item of selling expense, and especially the item of special discounts to jobbers and other dealers, which is now, I believe, extravagantly large. If my proposition is favorably considered, I can go into details concerning it at the conference."

The second salesman, Mr. Smith, whose territory was the central part of the country, west of Buffalo and east of St. Louis, and from the Canada border

to the Gulf of Mexico, wrote a very different kind of letter. He said:

"The entrance of competition in our field will bring about a situation like that of two gas companies occupying the same streets with their pipes, or two parallel railroads, each of which has facilities for handling all the traffic. There will be two factories, two selling organizations, a duplication of traveling expenses, advertising and the like, to do an amount of business that is scarcely large enough for a single concern. It is an economic waste, a waste of capital and of human energy. It leads to the struggle of the survival of the fittest, which impoverishes both parties, and finally destroys one of them. Now my human nature urges me to fight. I enjoy the heat of the struggle more than I do the fruits of victory, and if the directors decide on fighting and proving that our concern is the fittest to survive, count on me till the last stroke of the battle. But I recognize the fact that the directors are trustees for the stockholders and that they must not make the decision with reference to any one's personal feelings, but entirely with reference to the preservation of the stockholders' capital and the earning of dividends. We must not go into battle unless we know that we are stronger than the enemy and that we are sure to win before our capital is exhausted.

"Now, from what I can learn, the enemy is stronger

than we are. We have a better and more modern factory, and better management inside of the factory, but he can modernize his factory and improve his management as soon as he makes up his mind to it; he has more reserve capital than we have, and less expensive selling methods in proportion to the extent of his business, which is two or three times as great as ours. When he builds machinery like ours, it is a matter of little consequence to him whether he sells twenty or forty or sixty per cent of the total demand, but it is a matter of life and death to us. We have followed Carnegie's motto, 'put all your eggs in one basket and watch that basket,' [1] and that is our weakness; we may not be able to keep all the eggs from being broken; while our rival has followed the opposite motto, 'have more than one string to your bow,' and in that lies his strength. If one branch of his business fails, he has others to fall back upon.

"Now, my advice is: stop this competition. Go

[1] Mr. Carnegie did not follow his own motto. He became a partner in the Union Iron Works, making iron bar and structural shapes, and a stockholder in the Keystone Bridge Works; then he, with his partners, built the Edgar Thomson Bessemer Steel Works; then he built blast furnaces; bought the Homestead Works and made it an open-hearth steel works; bought the Frick Coke Works; made armor plate; built the Bessemer railroad to Lake Erie; made an ore deal and a steamship freighting deal, and threatened to build a tube works on Lake Erie, and would have built it if he had not been bought out by the U. S. Steel Corporation.—Ed.

to your rival and ask him to compare notes with you. Put all your cards on the table, face up, and ask him to do the same. Show him that if he really intends to make and sell your machines, you can build your machines more cheaply than he can his; that if he will give you his patterns you can contract to build his machines for him more cheaply than he can build them himself, because you have a better factory for the purpose, better machinery, and scientific management, which he has not; that if he has a more extensive selling organization and lower selling costs on account of the greater magnitude of his business, you can make your selling costs still smaller by discharging your salesmen and getting rid of their expensive methods of getting trade, advertising and sending circulars to your prospective customers naming prices which he cannot meet without loss. He will no doubt tell you, if he is the average business man, that he knows his own business, or at least he thinks he does, and that he intends to proceed in the course he has laid out, until he has tried it out for a year or two, and that he does not care to enter into any negotiations with you at present. Tell him you are in no hurry, that he can think the matter over for a week or two, and that then he may possibly have some proposition to make to you, or you may have one to make to him.

"In the meantime, prepare yourself for his final

refusal to negotiate in any way. Find what products he is making that are staples of large and universal demand and in which there is an open market, not controlled by a trust or 'gentlemen's agreement,' and in which the entrance of one new producer will not tend to a general cutting of prices. Such a product is what is needed for your factory to keep it running full time in case the demand for your regular line is divided by competition. Then, if he insists on competing with you in your special line, you can compete with him in his staple line.

"If, however, he is amenable to reason, he will see that it is a foolish waste of resources for two factories to be making similar products of limited demand when one factory could make them much more cheaply, and for two selling organizations to be competing when one is easily able to do all the business. He may be ready to make you a proposition to give you all the manufacturing of his machines and for him to do the selling of your machines in addition to his own, he taking over your salesmen, who are acquainted with the trade, into his organization. Your lawyers will be able to tell you whether such an arrangement is a 'combination in restraint of trade,' in violation of the Sherman Act. I do not think it is. But if it is, there are no doubt plenty of other ways, and legal ways, by which the economic waste due to two factories doing the work of one

may be avoided. If the competition cannot be avoided, ruin stares you in the face, and probably the best thing then to be done is to sell the factory and retire from business. The next best thing is to find some other products to make. I cannot suggest what to make at present, but I may possibly think of some before the meeting."

The third salesman, Mr. Robinson, who had charge of the eastern district, wrote to the effect that he did not consider the situation at all serious. "If competition cuts the sale of our present line in half," said he, "let us get another line. There are plenty of other things to be made in the world besides our machines, and all we have to do is to hustle around and find something which we can make with our factory equipment and for which there is a large and steady demand, and go ahead and make it. For example, let us consider the making of small gasoline engines of 1 to 6 horsepower, for motor boats, pumps and farm purposes. There are perhaps hundreds of concerns making them, but not over a dozen making them at the same time of high quality and low factory cost. Let us make a systematic investigation of the smaller factories that are making good engines but at a high cost, and of the factories large and small that are making poor engines at all kinds of costs, and see if we can find a set of patterns and models that can be adopted as standard for a

first-class engine. Let us standardize the bedplates, cylinders, pistons, connecting rods, crank shafts and all the minor details, and prepare to make every part exactly right. Then we can offer to these factories either complete engines or any part of an engine. For some of them we can make and sell them a whole engine at a lower cost than they can make it themselves; for others we can make cylinders or bedplates or pistons or small parts more cheaply than they can make them, and they can do the assembling, adjusting, testing and selling. We need not attempt to sell the engines at retail; let the present makers do the selling while we do the manufacturing of engines and parts of engines.

"I suggest only as an example the making of gasoline engines for other people to sell. There may be a hundred other things that we can make which offer an equal or better opportunity. I have another suggestion as an alternative. Let each of our salesmen when he visits a town to sell our present line visit the manufacturers of metal goods in that town, and find what part of their product they would rather place contracts for outside than to make it themselves if they could find a contractor who would make it for them at a low enough price. Few of such manufacturers now make their own bolts and nuts or taps and dies, or small gears; they can buy them more cheaply than they can make them. They

would gladly buy shafts turned and ground to size, and many other things if they were offered sufficient inducements. Let our salesmen get a list of such things, their present cost, and the probable demand, and then we can select such of them as seem to be the most suitable for us and the most profitable, and prepare to make them. We might also advertise ourselves as being a general manufacturing shop for light- and medium-weight metal products, giving a list of our machine tools with their capacity, and let it be known that we have the best facilities not only for manufacturing in large quantity and at low cost, but also for designing, drafting, model- and pattern-making, testing, and in general assisting in developing new machines for inventors and others. I believe there is a lot of this kind of work lying around waiting for us to go and hunt for it."

Previous to the meeting the directors and the doctor had read and discussed the salesmen's letters, and each salesman as soon as he arrived was given the letters of the other two to read, so that at the conference he would be prepared to take part in the discussion of all the proposals that had been made. The doctor took the floor. "We have all been going on the assumption," said he, "that this competition is going to be exceedingly severe, cutting the amount of our sales in half and cutting prices to a point that will leave us no profit, but we have not made sure of

the facts. I therefore came to the conclusion before Mr. Smith's letter arrived to call on our prospective competitor and learn from him if possible just how strong his competition is going to be. Mr. Smith's letter gave me the idea to sound him at the same time as to his views on some kind of an arrangement by which we might build his machines as well as our own, while he would do all the selling. I found the president of the company a most agreeable and genial gentleman, and he was quite willing, as Mr. Smith suggested, to lay all his cards on the table, face upwards. He showed me, in the first place, that his competition was not going to be nearly as severe as we had feared. It was always his policy, he said, to have 'more than one string to his bow,' to make in his factory a variety of different products, so that when trade was dull in any one line he could put his machinery and his men on another line for which there was a more active demand. He was always on the lookout for some new product to make, one on which the experimental and development work had already been done, which had already found something of a market, and on which the margin between factory cost and selling price was large. He left to others the expensive work and the risk of developing new inventions and of educating the public to believe in them. What he wanted was to keep his factory running full on products for which there

was a large and steady market, keeping prices fairly low so as to hold his trade. By this means the fixed charges of both the factory and the selling department were kept low in proportion to the amount of business done. When his rivals began cutting prices on any article, he met them down to a certain point, and then he stopped manufacturing that article, letting the rivals have the trade, while he put his factory on more profitable work. He is an old-fashioned sort of man and has a stock of old-fashioned maxims by which he runs his business, such as 'Quick sales and small profits'; 'Live and let live'; 'Don't be a hog; give the other man a chance'; 'Don't do more business than your capital warrants'; 'A quick turnover saves capital'; 'Hoe your own row'; 'No entangling alliances.' He is entirely opposed to monopoly and to business consolidations of every kind. He says that Mr. Smith's proposed agreement is a proposal to maintain high prices by means of a single selling organization, that it means monopoly and nothing else, and is opposed not only to the letter of the Sherman Act, but to its interpretation by the 'rule of reason' by the Supreme Court. The public, he says, is entitled to a share in the savings that accrue to a factory by reason of its increasing volume of business, for it is the public that makes that increase of volume. The public also, he says, is entitled to the chance of getting the lower prices

which are due to competition, and any combination in restraint of trade, by which the public is restrained of its opportunity to get lower prices, is of the same nature in morals as any other kind of 'hold-up game.' It is only a question of time when either all such combinations will be dissolved by the courts, or else the public, through its power of constitution-making as well as law-making, will have an interstate business commission which will have the same control over prices as the Interstate Commerce Commission now has over freight rates.

"'Now,' says our gentlemanly rival, 'I prepared to make your kind of machines for the same reason that I might have prepared to make any other kind of machines for which my factory is adapted. I saw there was money in them, that you were charging a very high price as compared with the cost of labor and material that went into them, that you were handicapped by heavy selling expenses and by heavy fixed charges in your factory, which was running at only half its capacity on account of your making only a single line of goods. The only advantage you had over me was lower labor cost, on account of your improved machinery and scientific management in your factory. To offset this I have the advantages of low relative fixed charges in the factory, on account of running the factory full on different lines, and what I may call scientific management in

the selling department, by which every dollar spent in that department is watched to see that it produces a proper return. Suppose I had not undertaken to make these machines. It was only a question of time when some one else would make them. High prices and large margins for profits always invite competition; and if we did combine it would not be long until another competitor arose.

"'You need not be alarmed about my competing with you on these machines. I don't expect to cut your prices the first year more than about ten per cent, and I don't expect that the business I shall do will be a quarter of yours. You can easily recoup yourselves and retaliate on my concern by making and selling some of our specialties. You are free to make any of them except those that are protected by patents. There is no need of our being enemies because we are rivals in business. When my factory is so full of work that we have to buy some parts of our product outside I shall be glad to contract with you for any of these parts that you can make at a reasonable price.'"

CHAPTER VII

The Doctor's Opinions and Recommendations

THE doctor concluded his recital of his conversation with the competitor, and said "There is no use of considering further any plan for stopping competition. We have to meet the facts that our volume of sales is going to be diminished and that prices are going to be reduced.

"I have been talking with our general manager and find he is perfectly willing to be relieved of all responsibility connected with the selling organization. He recommends that a sales manager be appointed, and that both he and the sales manager be made directors of the company so as to bring them in more complete co-operation than if each of them was merely a servant of the board. Questions of general policy both as to manufacturing and selling should be discussed and decided in the meetings of the board, but the factory manager and the sales manager should each be supreme in his own department in regard to details. I fully approve of this plan.

"I am also entirely in accord with Mr. Robinson's suggestion of a systematic investigation to discover

what other lines of manufacture we had best engage in, and also that we advertise for business as a general jobbing shop.

"I think Mr. Smith is too pessimistic in regard to the effects of competition. He writes: 'Two factories, two selling organizations, a duplication of traveling expenses, advertising and the like, to do an amount of business that is scarcely large enough for a single concern—economic waste—survival of the fittest.' The fallacy in his argument lies in the words 'business that is scarcely large enough for a single concern.' The amount of business that we can do is not limited by the total demand for our special machines, for we can make other lines; it is not limited by the capacity of our factory, for we can get a large part of our work done by contract outside, or if we have surplus cash capital available we can enlarge our factory; it is limited only by our efficiency as salesmen, by our ability to find things that the world wants made and that we can make, and by the capital we have, or can get, with which to enlarge our business. As to the survival of the fittest, our factory is the fittest; it will survive even if the company that owns it goes into bankruptcy. The machines that we make are the fittest; they will survive, even if we cease to make them, for they will be made by others. Our weak points have been inertia, or our failure to get enough things to make to keep the factory full

of work, and our failure to find cheaper ways of marketing our goods. Both of these failures are going to be remedied, the first by Mr. Robinson's plan of getting other work to do, and the second by a change in our selling methods, which includes the acceptance of Mr. Brown's proposal, if we can agree on details, to be our exclusive western agent, and the appointment of a new sales manager. I have investigated Mr. Robinson's past career, as well as the work he has done for this concern, and have obtained his views as to the work of a sales manager, and as the result I shall have the pleasure later, when we come to formal business, of nominating him for the position."

Mr. Robinson was then asked to give his views, and after thanking the doctor for his kind words, said:

"There are two things that I wish to speak of in connection with the future of our business. The first is the necessity of conserving our capital so as to be able to meet the shock of hard times, of which there are some symptoms in sight. While we must extend our business into other lines, in order to get enough work to keep the factory running, we must not run into any speculative ventures that will tie up our capital. We must not spend any large sum on new patterns or special tools, or invest largely in the manufacture of goods for which we have not orders

in advance. I would make it a condition of our manufacturing any new line that it does not involve the use of any more of our capital than we feel perfectly able to afford. We must not rely on banks to help us out of difficulties if hard times come. I have in mind the failure of a firm with a half million of capital, while doing a very profitable business. Its assets were: Real estate and construction, $600,000; stock in trade, bills and accounts receivable, $1,000,000; bonds, bills and accounts payable, $1,200,000. Capital stock paid in, $500,000; debtor balance of profit and loss account, $100,000. The assets were $400,000 more than the liabilities, but while $500,000 cash capital had been paid in, $600,000 had been spent in land, buildings and machinery, making the working capital minus $100,000, which had been further decreased by the losses of getting a new business fairly started. It was at length doing a fine business at a good profit, being carried along by its bondholders, bankers and other creditors. When hard times came the banks contracted its line of credit, and it had to fail. It is a dangerous thing to have a widely expanded business with no available reserve capital when a depression is approaching.

"The second idea I have is that we must prepare ourselves for great changes in methods of doing mercantile business. Thirty years ago an iron works owned one or two blast furnaces; it bought ore, coke

and limestone from three different concerns; it made pig iron and sold it to a rolling mill, the mill puddled the iron and made it into muck bar, which it sold to another mill that made it into nails, which went through wholesaler, jobber and retailer to the final consumer. Here are nine different selling transactions between the material in the ground and the final purchaser of a pound of nails. The day is near at hand, if it is not already here, when nails will be bought in a hardware department store which is owned by an iron and steel company that mines its own ore, coal and limestone, makes its own pig iron and carries it through all its transformations until it is made into nails. On the other hand, we have department stores that own factories and that contract for the whole output of other factories. Again we have mail-order concerns, like Sears, Roebuck & Co., that sell the product of hundreds of factories, and may, before long, own a large number of them. Some day a department store or a mail-order concern or some other kind of selling organization may come along and want to contract with us to take our whole output, or ask us to act as general manufacturers, making different things to their order. We may find that it will pay us well to divorce our factory from the selling organization entirely, and to sell our output to a new company, in which we may or may not be stockholders, which

will guarantee to keep the factory full of orders and furnish it enough capital to pay its material and labor so that it will be relieved of the burden of financing. We may find it advisable to organize a Machinery Selling Co. ourselves, with our own and with outside capital, to become the general sales agency of several machinery concerns that are making different lines, and are, therefore, not in competition. This is not a combination in restraint of trade, but it is a combination for efficiency, making great savings in the cost of selling, and resulting finally in the reduction of prices to the consumer while giving a fair profit to the manufacturer. Understand, I am not proposing to organize any such concern at present. I am only mentioning it as one of several methods of reducing the cost of selling."

One of the directors then addressed the meeting and said: "There is one thing in the doctor's method of diagnosing and prescribing for the diseases of an industry that I am especially pleased with; it is that he does not go off at half-cock and express an opinion before he has carefully studied the facts, and that when he wants an opinion from others he writes out the questions and gives sufficient time for them to be studied and the answer put in writing. Following his example I have written out a question as follows: 'What is your present opinion (subject to revision after further study) of the existing status

of the business, and what are the steps that you recommend be taken immediately and those that you recommend should be postponed for the present but investigated with a view to future action?' I would like the answer to be put in writing so that I can take it home and think it over. Since the question does not call for a final opinion or report, but only for a provisional one, which the doctor can amend to-morrow if he sees fit, I trust he may be willing to dictate the answer at once, so that each one of us may have a typewritten copy which may be used as a basis for further consideration." The doctor agreed to do this, but said that on account of no time being given him for careful preparation of a written opinion, what he would have to say would be fragmentary and disjointed, and it would be, as stated in the question, "subject to revision." He then dictated the following:

First as to the present status: *Factory.*—Location, buildings, machinery, labor supply, scientific management of production, all excellent. Factory manager—highly capable, as regards production, untrained as regards management of sales and especially as to devising future policy of the business.

Kind and Quality of Product.—Excellent, but too many sizes of some kinds are made, making it necessary to keep on hand too large a stock of machines and of more or less finished parts. The design of

some machines might be altered with a view to greater economy in their manufacture.

Extent of the Market for Present Products of the Factory.—Only large enough to keep the factory running to from one-third to one-half of its maximum capacity. Prospects that even this market may be curtailed by competition and by possible general depression of trade.

Sales Department.—Well managed according to the prevailing methods, but costly, involving high costs of distribution and high prices to the final consumer. In the western part of the country the cost of distribution will be lowered by the new contract with the company's western representative. In the rest of the country the ratio of cost of selling to selling price will increase if the volume of sales is reduced.

Plans for Future Development.—None have as yet been made.

Capital.—Sufficient to keep the factory running to its full capacity without large borrowing of money, provided there is a quick turnover, so that the lapse of time from purchase of raw material to the collection of bills for goods made of this material is from three to six months; insufficient if there is a slow turnover, due to large amount of raw and partly finished material, to large stocks of finished goods awaiting sale and to slow collections; insufficient also to allow

for any large expenditure of money to improve the power plant and to change designs and patterns for the purpose of cheapening cost of production.

Next, as to recommendations:

Factory and Product.—Make no changes either in the equipment of the factory or in its system of administration at present. Employ a power-plant expert to make a preliminary report on what had best be done to decrease the consumption of coal used by the power, lighting and heating plant, and on what advantage, if any, there would be in purchasing current for power and light from the central station. Have the chief draftsman report what benefits would accrue from minor changes in design with a view to cheapening cost of production. Have the general manager report what objections there are to abandoning the making of the smaller sizes of some of the products, and the advantage that would result from this course. Have him report also on the desirability of purchasing from other manufacturers certain small parts instead of making them in the factory, assuming that the machine tools now used for making them could be employed for a large fraction of their time in making other things.

Extent of the Market.—Have the sales manager interview some manufacturers of machinery who have established a foreign trade, export agents, and others who may be posted on the export trade in

American machines, and get some information as to the possibility of doing an export business in our products and as to the ways and means of starting such business. One of his clerks might examine the files of consular reports to find if any of them contain any useful information as to the prospects of a foreign trade in our goods. He should also write to the American Association of Commerce and Trade in Berlin, 59–60 Friedrichstrasse, Geo. S. Atwood, Secretary, asking for a copy of the Year Book of that association for 1912, in which will be found some information on the subject of American exports to Germany. The association has been in existence since 1903, and one of its chief tasks is that of giving assistance in the introduction of American goods into Germany.

Sales Department.—This department should immediately start investigations on two lines: first, the possibility of diminishing the cost of distribution, so that our selling price may be reduced without greatly reducing our profits; and, second, to discover what other products the factory can make that will meet with a large sale at a reasonably good profit. The reputation of our present line of goods is now so well established that it is probable that dealers may be found in every large city who would be willing to take agencies for them at a low discount. Care must be taken, however, to insure that such agents are

already noted for handling only goods of the highest quality and for their enterprise in covering thoroughly their respective districts.

For the purpose of discovering what other goods may be profitably made a conference should be had between the general manager and the mechanical expert with whom we have already been in consultation, the sales manager and our other salesmen, with a view of making a list of machines, and also of parts of machines, which may be made with our present equipment of machine tools, and which are in large demand. This list should then be used by our salesmen in making a thorough canvass of the country for the purpose of securing information that may be used as a basis for beginning negotiations with dealers and with factory owners who may be induced to purchase from us such machines or parts of machines. We might prepare circulars and advertisements reciting in plain language these facts: that we have a large, modern factory equipped with the best modern tools, planers, shapers, slotters, lathes, drills, single and multiple milling machines of various classes, boring machines, turret lathes, grinding machines, etc. (naming the sizes and capacities of each class of tools), together with a capable engineering force, including designers and draftsmen, a forge shop and a pattern shop; that we are now engaged in building special machines the demand for which is

not sufficient to keep the factory engaged for more than half its time at full capacity; that we are prepared to do a jobbing and contracting business ranging from the design and pattern work for single machines for special use up to manufacturing standard articles on a large scale; that we are prepared to make parts of machines, such as crank shafts, connecting rods, springs, bearings, hand wheels, gears, etc., that are in general use, at lower cost than they are made in most factories, and that we will guarantee these parts to be of the highest class both in material and workmanship.

We should establish standard dimensions for most of these parts and do what we can to encourage the use of such standards, so that we can manufacture them in large quantities, and therefore at the lowest cost.

Capital.—The working capital of the company is sufficient for the present extent of the business and for a moderate expansion not requiring any investment for additional equipment. More concerns have gone into bankruptcy for lack of sufficient capital to provide for extensions and to endure financial crises than from any other one cause. We are now facing a probable depression in trade, and it is therefore highly important that we conserve our capital and do not make any new ventures until the danger is past. It is equally important, however, that we prepare for

the next boom, which is certain to follow the depression, by getting such new equipment as may be necessary to take care of the increased business, and also either obtain the additional capital needed to handle it or else to change our business methods so as to utilize our present capital more efficiently. In the manufacturing department this may be done by a careful supervision of our purchases, so that raw material is not purchased too long in advance, and by such a planning of the passage of the material through the shop that too much capital is not locked up in partly finished product. In the selling department we can utilize capital more efficiently by not giving so long credits and by greater promptness in making collections.

When the business increases to such an extent that more working capital is needed to handle it, we may get along for a time by using our credit, purchasing material on longer time, or borrowing money from the banks, but these methods are exceedingly dangerous, involving not only the cost of interest, but the risk of being squeezed by the banks or other creditors when our credit is stretched beyond a safe limit. The issuing of bonds is a safer way, but this is apt to lead to disastrous results when the bonded indebtedness amounts to a large fraction of the total capital. The only safe way is to obtain increased capital by the issue of new stock. This is easy to

do when the times are good, when the business is profitable and the surplus is regularly increasing, but extremely difficult in times of depression, when money for investment is scarce and when those who have money are timid. We have seen in recent times many examples of large concerns doing a highly profitable business going into the hands of receivers because the business had expanded beyond the point justified by the available working capital.

The doctor then concluded his dictation by saying that he had no more recommendations to make that day, but that he might have something more to say on the morrow, after he had read over the typewritten copy of what he had already said. The meeting then adjourned.

CHAPTER VIII

Proposed Reorganization of the Board of Directors

THE next day the conference with the salesmen was continued, but none of them had anything of importance to contribute and the conference soon adjourned, the salesmen retiring; the directors asked the doctor if he had revised what he had dictated the preceding day, and if he had any further recommendations to make. He replied that he had read it over, and had no alterations to make in it, but he wished to say something more, but not for record, as it was only a preliminary statement, which would precede a proposal he had written out. He said:

"When I was a practising physician I sometimes had to use strong language to my patients in order to give them a realizing sense of their ignorance or neglect of the rules of health, and I think some strong language is now needed in regard to your management of this business. Why do you have directors who are mere figureheads, who know nothing of any manufacturing business and whose only function is to meet once a month and hear your general manager tell you how the business is running and to tell him to go ahead as

he is doing? You are not directing, you are merely shifting your responsibility to the stockholders onto one man and giving him a load that is too heavy for one man to carry. What you should do is to get a board of directors who can become acquainted with the business by having a working connection with it and who thereby may qualify themselves to direct. You are not a board of directors, you are only a stockholders' committee, and you represent the stockholders merely by attending meetings and receiving reports. Of course you will answer that the stockholders must elect from their own number directors who will represent them and watch the expenditure of money. I will admit that you have done this watching well, that is you have verified all the vouchers and satisfied yourselves that the purchasing has been done honestly and wisely, that salaries have not been extravagant, that labor has not been overpaid, and that there is no graft in any part of the business; but all this could be done by a stockholders' committee or by a paid auditor. Expenditure of money is only one part of the business; you have neglected the other and the greater part, which is income. You have not planned ahead so as to insure that you will have an income to meet the expenditure. You have not only neglected this duty, but you have never discovered that it is your duty."

The doctor stopped to take breath, and one of

the directors interjected, "It seems to me, doctor, that you are forgetting one of your own mottoes, 'too many cooks spoil the broth,' and another one, 'never to do anything that you can hire another man to do better than you can do it yourself.' We directors, a wholesale grocer, real estate operator, treasurer of an insurance company, and the like, being aware that we know nothing of manufacturing, thought we were doing well in employing an able general manager who was willing to assume the responsibility of the whole work and trust him to run the business. If we had interfered with him and nagged him we would not have been able to keep him."

The doctor replied, "I thought I made it clear when I spoke the other day of mottoes and maxims that none of them can be taken without limitations, and that there is an antidote available when any one of them is taken in excess. To the first of your mottoes we have, 'in the multitude of counselors there is wisdom,' and, to the second, 'never overwork a willing horse.' I do not mean that you directors should undertake to be counselors, for you are not qualified to be; the counselors should be experts. As for the 'willing horse,' the general manager, as long as the business consisted in manufacturing a single line of goods, and as long as he had the good luck to get salesmen who knew how to dispose of them, he was not overworked, but as you yourselves

have said, his mind 'runs on a single track,' and he would be overworked if you had put on him the responsibility of developing the business along new lines. Fortunately, this extra responsibility has not been placed on him, and no harm has yet been done, but we have now reached the developing stage, and we must now plan out for the future.

"What I now propose is a new organization, beginning with a new board of directors, some of whom at least shall be active officers of the corporation doing actual work in one or more departments. Those directors who retire because it is inconvenient for them to take their share of the work may be constituted a stockholders' committee, whose duty is to meet from two to four times a year to receive and discuss reports made by the board of directors, and who may, if they see fit, employ once a year an auditor to examine the books, and a business expert to report on the conduct and the prospects of the business.

"One of the elements of scientific management as now employed in the production of manufactured goods is the use of 'functionalized foremen.' I now propose to functionalize the directors, giving each of them the specific work to do for which he is best fitted, and to have the whole business supervised by functional committees, of each of which the chairman is the executive head of a department and the other members are his advisers and assistants. I

suggest that the few principal stockholders, who hold a large majority of the stock, get together and select from their number three directors, who are versed in general finance, who will serve for nominal salaries as president, vice-president, and treasurer, the duties of their offices being so arranged as to take but a small portion of their time; also four other directors, three of whom, the general manager, the sales manager, and the secretary, shall receive proper compensation for their full time, and the fourth, whom I shall call the 'adviser,' shall serve without salary. If it may please you, I nominate myself for this position, and you may give me one share of stock to qualify me to be a director. For the position of secretary I would nominate our excellent chief clerk of the sales department, who is a broad enough man to fill a more responsible position than the one he now holds.

"The first work of the new board of directors will be to plan the complete organization of the business, to frame a new set of by-laws establishing functional committees of the directors, and defining the duties and authority of the committees and of the executive officers. I have written out a plan of organization which I will submit for discussion.

"I divide the whole business into seven departments, each of which is supervised by a functional committee, as follows: (1) Finance; (2) Accounts; (3) Information and Statistics; (4) Factory; (5) Labor; (6)

Sales, and (7) New Development. The committees I would form as follows:

(1) Finance.—President, general manager, adviser.

(2) Accounts.—Vice-president, treasurer, secretary.

(3) Information and Statistics.—Secretary, vice-president.

(4) Factory.—General manager, adviser, sales manager.

(5) Labor.—Secretary, general manager.

(6) Sales.—Sales manager, general manager, secretary.

(7) New Development.—Sales manager, general manager, treasurer.

"The reasons for the assignment of the several officers to their respective committees, and the functions of each officer are as follows:

"(1) Finance.—The president, being one of the largest stockholders, should be the leader in important financial matters, such as banking, borrowing, issuing of bonds and stock, expansion or contraction of the business, and granting of credit. The general manager should be in touch with him, to inform him of the financial needs of the factory, and the adviser may be of assistance in bringing financial information from outside. This committee should if possible come to an agreement before submitting financial propositions to the full board of directors.

"(2) Accounts.—The vice-president, being a large

stockholder, will be interested in obtaining a proper system of keeping accounts, and in studying the accounts and drawing conclusions from them which he may submit to the finance committee. The treasurer will see that the accounts are so kept as to give him the information he needs when questions come up as to dividends, investment of money, delaying purchases in order to conserve the bank balance, purchasing ahead in order to get the advantage of low prices, and the like. The actual work of keeping the accounts is to be done by the secretary and his clerks.

"(3) The whole system of filing of correspondence, price lists, catalogs, etc., and the keeping of a bureau of information for every department of the business should be in charge of the secretary. He should also compile monthly and annual statistics and charts of all important facts that may be needed by any department. The vice-president is made a member of this committee as well as that of the committee on accounts so that he may have a say in deciding what statistics and charts should be kept, and so that he may have all facilities needed for drawing all the conclusions that may be drawn from statistics, which in themselves are of no importance unless they lead to conclusions. It is advisable also that the vice-president add to the duties of his position the functions of a 'leak hunter,' or if he is not able to perform

these functions himself, he may have them done by a subordinate, who preferably should be an experienced engineer, and who may be given the title of assistant to the vice-president. (See editorial article on The Leak Hunter, *Industrial Engineering*, March, 1910.)[1]

"(4) Factory.—The general manager should retain his present position as autocrat of the factory, but he should consult with the adviser, who may bring him information as to what is being done in other factories, and with the sales manager, who can inform him as to prospective demand for the different products, to enable him to prepare ahead to meet the increased demand, or to delay the production of some lines so as to avoid piling up stock. He should consult with his committee in regard to important changes in equipment or manufacturing methods, and obtain the approval of the committee before making propositions to the board of directors.

"(5) The formation of a labor committee is for the purpose of throwing upon the secretary, who has statistics of labor costs, records of workmen and the like, much of the burden with which general managers are usually oppressed, of handling all questions relating to wages, promotions, working conditions, welfare work and the like. The general manager and

[1] See Appendix.

the secretary can agree upon a satisfactory division of the work of this committee between them.

"(6) Sales.—The sales manager is the autocrat of the sales department in so far as handling the salesmen is concerned, but he should consult with the general manager as to the advisability of pushing certain lines so as to keep certain parts of the factory full of work, and with the secretary as to statistics of cost of production and of selling, so that he may know which lines should be pushed the hardest in order to obtain a maximum annual profit. Questions of changes of prices and of important contracts should be discussed by the full committee.

"(7) New Development.—This committee should have constantly before it the question of what to make and what not to make, and the duty of discovering new lines in which a good profit can be made. The treasurer is made a member of this committee as a check against its undertaking a new line of work before the capital is available for it. The secretary might be added to this committee if it appears that his information bureau and his statistics put him in position to be of service to the committee. Such questions as the one now before us, that of methods of meeting new competition, may be referred to this committee for investigation and report to the board of directors. The committee should prepare annually a report giving the results of its work, and

recommending what new work should be undertaken or what old lines modified or abandoned.

"Foremen's Committee.—In addition to the committees of directors, I would recommend the formation of a committee of three foremen, taken in rotation from the whole body of foremen, each member serving one year, with one member entering and one leaving the committee at the end of each four months. The duties of this committee are: (*a*) Advisory, to consider and report to the general manager on accidents and their prevention; condition of machinery; comfort and welfare of the workmen; old age and disability pensions; apprenticeship system; improvements of the factory or factory methods; complaints by foremen or workingmen. (*b*) Executive. Authority may be given by the board of directors to this committee to take action on any matters that may be referred to it by the board. A formal report of its proceedings should be made by this committee to the board three times a year, and special reports whenever they are called for by the general manager.

"Understudies.—The three high-salaried officers, the general manager, the sales manager and the secretary, should each be provided with an assistant, who should be trained to become so familiar with all the details of the work of his chief that he would be competent to fill his place during his temporary

absence and finally to succeed him in the event of his retirement."

The doctor finished his reading, and proceeded orally as follows:

"I have typewritten copies of this document for each of you. I wish you would study it to-night at home and come prepared to discuss it to-morrow. I do not think it will be profitable to discuss it now. I wish to call particular attention to the fact that the principal element in my proposition is a re-constitution of the board of directors, making it a working body instead of a stockholders' committee. It does not need to meet as a board in formal session oftener than four times a year, but its members should be always working either as executive officers or as members of functional committees. All the other suggestions I have made are subordinate to this one, and, if thought best, their consideration may be postponed until the first meeting of the new board. The titles and composition of the several committees may be left to the board, and special committees may be formed for either temporary or permanent purposes; thus the president, vice-president and general manager might be made a committee on new buildings, with authority to employ an architectural engineer, and the vice-president, treasurer and general manager might form a committee on purchases, with authority to appoint a purchasing agent and to exercise such

supervision over his work as may be needed. The board might also authorize the regular committees to employ experts to aid them in their several functions; thus the finance committee might want to employ legal counsel; the committee on accounts an auditor or expert accountant; the factory committee a power plant and a mechanical expert; the labor committee an expert on sanitation or on welfare work; the sales committee an advertising expert.

"I regard as the most important of the functional committees at the present time the one on new development. Its work in recommending to the directors, after thorough investigation, what to make and what not to make, is that upon which the future success of the business may depend. Its mistakes may be more costly than those of any other committee. The usual mistake is that of underestimating the amount of capital required to develop a new line. In this connection the following press despatch in this morning's paper may be of interest as a warning:

A receiver was appointed today for the Michigan Buggy Co. of Kalamazoo, manufacturers of the Michigan "40" automobile. It is stated that the liabilities will total $1,600,000. The Company manufactured buggies for thirty years. Insufficient funds to conduct its business since the manufacture of automobiles was begun was a reason given for the receivership.

"I think we had better now adjourn until to-morrow afternoon, so that you may discuss during the morning the substance of my proposals.

One of the directors said, "I don't want to discuss the matter now, but it seems to me that the doctor is proposing to have an enormous amount of red tape in this business." The doctor replied, "One of the essential elements of scientific management is study of the subject of waste, whether of capital, material, or time, or even of ink and of red tape. The work of the committee on information and statistics, and especially that of the 'leak hunter,' will include the study of whether the excessive use of red tape hinders the progress of work or is costly in itself, and of finding ways by which the use of red tape may be curtailed. The words 'red tape' are now used, as you know, to signify any systematic method of making records, issuing requisitions or orders, checking against mistakes, countersigning checks and the like. In scientific management properly applied this so-called red tape is used only so far as investigation shows it to be necessary or desirable, and automatic machinery or other means are used to make the quantity of it as little as possible."

CHAPTER IX

Duties of the Functional Committees of the Board of Directors

THE next afternoon another meeting was held as agreed, and the president of the company said, "Doctor, we had a meeting this morning at which all the directors were present and four-fifths of the stock was represented, and after a thorough discussion of your proposal it was unanimously agreed to accept the principal one, that of reorganization of the board of directors. We agreed also that the president, vice-president, and treasurer retain their present offices, and that the other four directors resign, their places to be taken by the general manager, the sales manager, the chief clerk of the sales department, who will be appointed secretary, and yourself. Our present constitution provides that the board may fill vacancies in the directorships, the new members to serve until the annual meeting of the stockholders. A special meeting of the stockholders will be held in two weeks to make the changes in the constitution and by-laws that may be necessary to fix the duties of officers and to provide for forming the functional committees and specifying their

duties. We can have a meeting of the directors tomorrow, at which the resignation of the four directors can be accepted one by one and their successors elected, and at which any other formal business may be transacted. We shall be glad to hear from you, doctor, if you have any other suggestions to make."

The doctor, after thanking the directors for the compliment paid him in accepting his proposal and in nominating him as a director, said:

"My work as adviser to the present board of directors is now finished, and I have no further suggestions to offer, but I have spent the morning in making a partial list of the many different things that have to be considered in connection with a manufacturing and selling business, and I have tried to assign the several items to their proper places under seven heads corresponding to the seven functional committees: finance, accounts, information and statistics, factory, labor, sales, and new developments. I shall refer this list to the new board, and ask that it be carefully studied and revised to insure that no important item is left out and that each is assigned to the proper committee. When it is finally revised I shall ask that it be printed on cardboard so that each director may have a copy, and that a copy be tacked up in the directors' room and in the office of each executive officer for convenient reference. The

chief use of such a list, besides that of recording the assignment of work to the several committees, is that of being an aid to the memory, so that when any director asks himself the question, 'what subject shall I now investigate, or what subjects shall I bring before the committee or the board?' he may look over the list and select from it the items that he thinks should now be considered, and make a note of them. Under the old system of management the manager usually did not consider a problem until it was forced upon him by some emergency; he was so busy forcing the material through the shop and getting orders filled that he had no time to take up subjects that could possibly be postponed, such as improved methods of production, and they would be allowed to pass out of his mind. By the new method, each committee has constantly before it a list of things to be thought of, and there can be no excuse for neglecting to consider them. Here is the list:

FINANCE

Committee: President, general manager, adviser.

Capital stock: outstanding; to be issued; plans for increasing.

Bonded debt; secured notes; bills and accounts payable.

Cash; bills and accounts receivable.

Investment of capital: in buildings and equipment; in raw material; in work in progress; in fin-

ished goods in warehouse and on consignment; in advance advertising.

Surplus available; for dividends; for reserves; for extensions of business.

Appropriations and other financial plans for coming years.

Banking: interest; use of credit.

Accounts

Committee: Vice-president, treasurer, secretary.

Book-keeping system.

Cost accounts; distribution of burden.

Book-keepers and clerks.

Cost of, and improvements in accounting system.

Auditing.

Information and Statistics

Committee: Secretary, vice-president.

Bureau of information: catalogues and price lists.

Filing system for correspondence, records, estimates, drawings.

Statistics and charts, monthly and annual.

Classification of sales statistics: by products; territorial.

Charts of production, of factory and selling costs.

Study of charts and drawing conclusions: products; variety; quantity; profitable or unprofitable; demand regular, seasonable or fluctuating.

Leak-hunting; inventories.

Factory

Committee: General manager, adviser, sales manager.

Products: design; quality; method of making.

Material: quality; specifications and tests; requisitions; seasonable purchasing; prices; storage; handling; scrap; by-products.

Designing; drafting; estimating.

Superintendents, foremen; foremen's committee; purchasing agent.

Blacksmith shop, pattern shop and store room.

Machine shop: equipment; arrangement of machines; handling of work in progress; interior transportation; care of tools.

Power plant; engineering tests; friction; lubrication; boilers and boiler appliances; means for improving economy; engines; condensers; dynamos; motors; power transmission; fuel storage and handling, ash handling.

New machinery for new or old products.

Load factor, means for increasing.

Consider purchasing certain small parts instead of making them.

Inventory of machines, age, cost, depreciation.

Items in scientific management of factory; tool room, tool grinder, messenger service; store-room; standard sizes and shapes of tools and of parts of product; planning room; routing; moving; cars, cranes, trucks, elevators; functional foremen; speed and feed boss; care of belts; disciplinarian; time, motion and fatigue study; standardizing operations; instruction cards; mnemonic symbols; wage systems; task and bonus; standardized records; graphical daily balance; plotting of results; effect of changed methods upon cost.

Planning ahead for work to be done in coming months.

Labor

Committee: Secretary, general manager.

Classification and records of workmen, length of service, promotions, wages, premium, bonus, piecework. Changes, desirable. Apprentices.

Methods of training workmen, apprentices' school.

Pensions, old age and disability; accident insurance; prevention of accidents; first-aid hospital.

Welfare work; sanitation; workmen's houses.

Complaints and suggestions by workmen. Workmen's committees.

Sales

Committee: Sales manager, general manager, secretary.

Selling methods; prices; discounts; commissions.

Contracts with salesmen, agents, and wholesale houses. Department stores; mail-order houses.

Methods of increasing sales; publicity advertising, correspondence, circulars, bulletins, cutting prices, exclusive contracts.

Methods of reducing selling expense. Training of salesmen.

Charts of history of business, and of expected business, classified by products and by districts.

New Development

Committee: Sales manager, general manager, treasurer.

Investigation of factory conditions, as to location

with reference to raw material, labor, climate, workmen's houses and surroundings, market for product, transportation, freight rates; as to buildings, with reference to size, shape, arrangement, floors, roofs, heating and ventilation, lighting, natural and artificial, fire protection, sanitation, safety devices. Investigation of the desirability of new buildings and of relocation of the whole or any part of the factory.

Investigation of changes in market conditions, such as lessened demand for products on account of competition, change of fashion, improvement in rival products, changes in methods of distribution; and making new plans in view of these changes.

Methods of finding new things to make and to sell, and of reaching conclusions as to what new things should be made, how and in what quantity they should be made, and what provision in the way of new equipment is needed for them.

Methods of extending the market; foreign trade.

Abandonment of unprofitable and obsolescent lines of products. Lessening of the variety of shapes and sizes catalogued and kept in stock.

When he had presented the list the doctor said: "I think we may now adjourn and await the call of the president for the first meeting of the board of directors, but I have three brief paragraphs concerning scientific management which I would like to have printed on the same card as the list of subjects, so that it may be a constant reminder to each member of the board concerning his duties and his mental attitude. I will read them.

Scientific Management

"Scientific Management includes the critical observation, analysis, and classification of all industrial and business phenomena, and the systematic application of the resulting records to secure the most efficient production and distribution of products and to make preparations for future developments. Its most prominent element is the mental attitude that consciously applies the principles of scientific investigation to all the phenomena of business and the transference of skill to all its activities.

"The mental attitude referred to above is the exact opposite of that mental inertia that leads one to say 'whatever is is right.' On the contrary, it leads to the saying, 'whatever is may be wrong; I am going to investigate and find out whether it is right or wrong.'

"Duties of the Executives under Scientific Management.—Executives must have a practical knowledge of how to observe, record, analyze and compare essential facts in relation to all that enters into or affects the economy of production, the cost of the product, the present and prospective market for the product, the selling department, and the possible profits."

On motion, the meeting adjourned.

APPENDIX

A New Kind of Factory Expert—The Leak Hunter *

THE president of a large manufacturing company recently asked us to recommend a man for a new position he wished to create in his factory to relieve the manager of some work which the manager was supposed to look after. The existing condition of the concern was outlined about as follows: There is a large and splendidly equipped factory full of orders, well organized, doing a reasonably profitable competitive business. The president is the chief executive. He decides upon the general policy and is directly in charge of the sales department, whose duties it is to fill the factory with orders for the most profitable kind of goods. The general manager's duty is to get these goods produced and with the maximum of profit per piece. The labor situation is satisfactory to the workmen, piece work being generally introduced. The machine tools are of modern make, speeded to the limit, and the facilities for handling goods are excellent. There is a good cost system and every detail of cost is faithfully recorded. There are also a works chemist and a physical testing laboratory.

* An editorial in *Industrial Engineering*, December, 1909.

On the surface of things no factory could be in a better condition. Every man appears to be doing his full duty, and the manager especially is driving things to the utmost. The president, however, is not satisfied. Competition is intense, prices of many of the articles sold offer small margin of profit. Fashions in forms of the things made are changing. There has to be a large force of draftsmen and wood and metal patternmakers employed to keep up with the designs that are called for. Sales are tending to increase, some departments are overcrowded, and the management will soon have to face the problem of either making extensions or abandoning some departments to make room for the growth of others. Power seems to be costing too much. Will it pay to change the system of generating and transmitting power? Are the iron and brass mixtures the best for which purpose they are used? Will it pay to put in automatic machines for some of the work? Should some of the parts of things now made in the factory be purchased outside? Should the premium system of paying labor be instituted in any part of the works for the part piece work and part day's work that now prevails? Can some of the machines be speeded up? Are any of the machines so far out of date or repair that they should be replaced by others? Is the cost system costing too much? Does it give all the information that it should? Are high-priced men en-

gaged a large part of their time in doing low-priced work?

The president cannot answer these questions. He is too busy in his own department to study them. The manager cannot, for his time is taken up in running things as they are, and he is satisfied with things as they are. The cost clerks cannot, for they are merely cost clerks. They tabulate the data, but have no power of reasoning from them.

The old-fashioned method of answering such questions was not to answer them at all if it could possibly be avoided. They were all considered questions of minor importance as compared with the question of driving the business, and the policy of the works was usually to "let well enough alone." Let the other man do the experimenting in new methods. The modern idea is just the opposite. It is that there is nothing so well done in a factory that it might not be done better, but the trouble with this idea is that no one has either the time or the knowledge requisite for the systematic study that is needed in order to make a wise decision in regard to making changes in machinery or improvements in methods.

The president of the concern referred to recognizing this fact wishes to employ some one to study the general problem of what things in the factory need to be improved and then how to improve them. We gave him the names of some of the leading outside

experts on factory organization and advised him to apply to them for assistance. His idea is, however, that he should permanently employ some young man in the factory to look after the matters and be a sort of perpetual "leak-hunter."

It is a serious question whether any one who is brought up inside of a factory can be as successful a leak-hunter as one who has had a special training in that direction. The ideal man for the purpose would be one having both theoretical and practical knowledge of factory operations and management and who has also had considerable outside experience under the direction of leading experts in this line. Such a man would necessarily be a very high priced man, so high priced indeed that it would require considerable courage on the part of the president of a manufacturing concern to employ him. The services asked of such a man are not those of either a clerk or a manufacturing superintendent. They are, in fact, those of a skilled diagnostician of factory diseases. The possible number of such diseases may run into the hundreds and many of them are difficult of detection. The man who can ferret out and devise the proper remedies is as important to a large organization as either the president or the general manager.

In one concern we visited some years ago we found a man who was known by the title of "Statistician." His business was to be able to answer every possible

question that the general manager could ask him if the answer could be expressed in the shape of figures. It would seem that the modern factory must have, first, a well-planned cost system, a statistician who is able to digest the cost system and make abstracts and plotted diagrams from it, and finally a skilled leak hunter, as we have termed him, who can interpret these diagrams and abstracts and from them draw conclusions as to what changes ought to be made in the way of doing things in order to increase the efficiency of the factory. The leak hunter probably exists in many factories, but under a different title. He will be a necessity of all large factory organizations in the future.

Locating an Industry

SOME philosopher has said that if a man makes even a mouse-trap better than any one else, though he build his hut in the woods, the world will make a beaten track to his door—or words to that effect. In the good old days, before trade papers existed, the statement may have been true. Somewhere in the State of New York, in the early part of the last century, David Maydole made some good hammers, and his neighbors began beating the track to his door, and finally the whole world came to him for hammers. In those old days factories were not

* Editorial in *Industrial Engineering*, December, 1913.

"located," they "just growed," and their location was usually the town in which the owner happened to live. Many famous concerns had their beginnings in this way in locations which nowadays would be thought to have many disadvantages. The Fairbanks Co., in St. Johnsbury, Vermont, is an instance. The great copper and brass industries in the Naugatuck Valley, Connecticut, grew in a location that would now be considered far from the best. The handicaps of distance from raw material, from fuel, and, in many cases, from the market, were overcome by the advantages of cheap labor, of business enterprise, and of reputation for quality of product.

In modern times, however, these special advantages which were held by some manufacturers are disappearing. Cheap labor has gone, business enterprise is becoming universal, and goods are now bought on specification and test rather than upon the name of a brand. Reputation, which used to be obtained by long years of struggle, is now obtained in two or three years by extensive advertising and by public demonstration of quality and performance. Success in manufacturing in the future is to be obtained not by mere reputation for quality and by two or three favorable conditions, such as ample capital and cheap labor, but only by the combination of all the desirable conditions, one of which is location.

The fact that locations that were good enough in past times are not good enough now is shown by the migrations of many large concerns and the establishment of new concerns in places far removed from the old centres of industry. The first great relocation of industries in this country took place in the iron trade. Fifty years ago its centre was in eastern Pennsylvania, chiefly in the Lehigh and Schuylkill valleys. Between 1870 and 1880 it was moved to Pittsburgh and vicinity, to Cleveland, to Chicago, and to Alabama. Philadelphia then was the centre of the heavy machine-tool trade, with numerous small concerns in New England; now Cincinnati and Cleveland are competing with them in foreign as well as in domestic markets. Shoe manufacturing, which used to be confined to New England, is now being scattered over the West. Cotton manufacturing has developed in the South. Of individual concerns that are moving or scattering, instances are the Baldwin Locomotive Works, of Philadelphia, which has built a new works on the Delaware, near Chester, and the General Electric Co., which is locating its new plant at Erie, Pa., on Lake Erie, instead of enlarging its plants at Schenectady and at Lynn.

In locating a new factory the owners should have a long look ahead into the future. Conditions are changing so that a location that is good to-day may not be good ten years hence, and hasty removal from

one place to another, following the crowd, may prove in the long run not to be good policy. An instance of this is the recent transfer of the manufacture of clothing from down-town to Fifth Avenue in New York. If the millions that have been spent in building sky-scrapers with marble fronts to accommodate the multitudes of sewing-machine operators had been put into a far cheaper location on the East River, close to the homes of the operators, it would have been well for all concerned.

Some of the conditions that should be taken into account in locating a new factory that is expected to become of great size are the following: With respect to material:—cost of obtaining raw material delivered at the factory; permanence of the supply from its present source; where other supplies may be had if the present source fails (lumber, for example). Cost of transportation of finished goods to the various markets. Transportation by automobile trucks, by rail, by water, river, lake or canal. (The opening of the Panama Canal and of the New York Water Barge Canal is going to affect some locations.) Cost of fuel, coal, oil or gas; if oil or gas, permanence of the supply. Water-power, quantity available and its probable permanence. Electric power from a central station, cost of, compared with cost from an isolated plant.

Real estate; first cost, taxes, present and prospective;

room for extensions; room for development of a workmen's town.

With reference to labor. Availability of an abundant supply, skilled and unskilled. Conditions for keeping workmen satisfied to remain in the works, nearness of city or town supplying good and cheap markets, comfortable homes, schools, playgrounds, churches, hospitals, medical attendance, recreation. Control by trades unions.

We regard this question of keeping workmen satisfied to remain in the works as one of the most important industrial questions of the future. It is not merely a question of wages and of hours, but of everything that enters into a workman's life. One of the chief real troubles of the workmen to-day is the high cost of food due to the unscientific methods of getting the food from the producer. It would be well for some of the concerns that are moving from the cities into the country to consider whether the time has not arrived for manufacturers employing one or more thousands of workmen to establish a co-operative store for them, which will buy produce directly from the farmers, and which will operate a cold-storage warehouse and a canning factory. In many companies to-day the workmen are sharing in the profits of the business by becoming stockholders. They also invest their savings with the company, and have accident insurance and old-age pensions. It is only

a further development in the same direction to provide the means by which they can obtain cheap food and so reduce the cost of living, and thereby make savings which may be invested in the company's stock. This is a far better way of overcoming the so-called "injustice of the present industrial system" than the plan that the Socialists are continually agitating, that of having the community or the State become the owner of all the implements of industry. It will be a step forward to the day mentioned by the late Abram S. Hewitt in an address made more than twenty years ago (*Trans. Am. Inst. Mining Engrs.*, 1890,) when, instead of capital employing labor, labor will employ capital.